HOBART®
GROUND POWER

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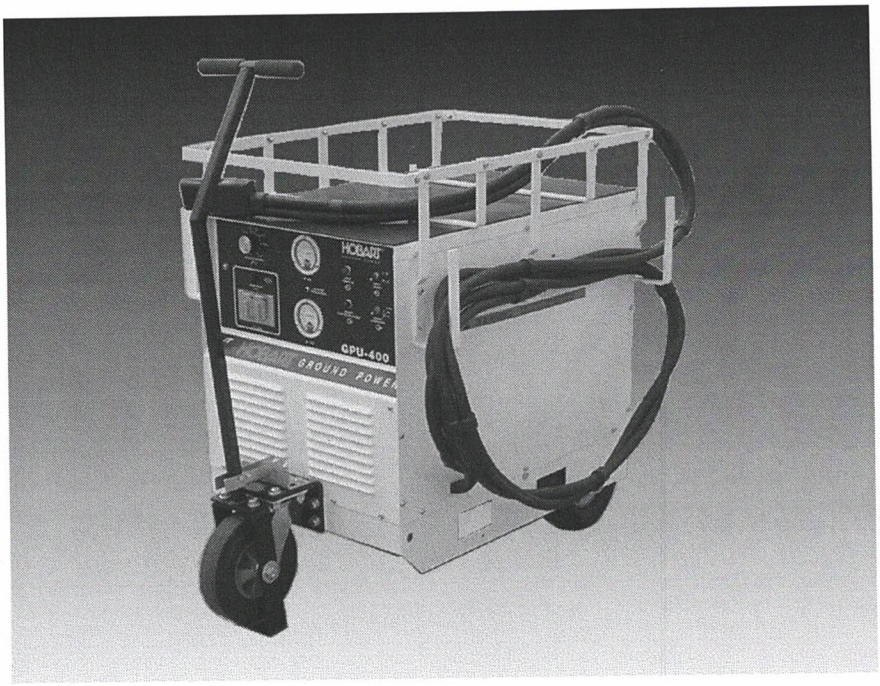
Operation and Maintenance Manual with Illustrated Parts List for GPU-400

3-Phase Solid State Transformer-Rectifiers



Series 500160-4xx
28.5 Volts, 400 Amps

Hobart Ground Power
Troy, Ohio 45373
U.S.A.

Operation and Maintenance Manual
with
Illustrated Parts List
for
GPU-400

3-Phase Solid State
Transformer-Rectifiers

Series 500160-4xx
28.5 Volts, 400 Amps

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Warranty

Data Sheet 165
Index: 990223
Replaces: 980601

HOBART GROUND POWER
TROY, OHIO 45373

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WARNING

AT ALL TIMES, SAFETY MUST BE CONSIDERED AN IMPORTANT FACTOR IN THE INSTALLATION, SERVICING AND OPERATION OF THE PRODUCT, AND SKILLED, TECHNICALLY QUALIFIED PERSONNEL SHOULD ALWAYS BE EMPLOYED FOR SUCH TASKS.

Safety Warnings and Cautions

WARNING

ELECTRIC SHOCK can KILL. Do not touch live electrical parts.

ELECTRIC ARC FLASH can injure eyes, burn skin, cause equipment damage, and ignite combustible material. DO NOT use power cables to break load and prevent tools from causing short circuits.

IMPROPER PHASE CONNECTION, PARALLELING, OR USE can damage this and attached equipment.

IMPORTANT

Protect all operating personnel. Read, understand, and follow all instructions in the Operating/Instruction Manual before installing, operating, or servicing the equipment. Keep the manual available for future use by all operators.

1) General

Equipment that supplies electrical power can cause serious injury or death, or damage to other equipment or property. The operator must strictly observe all safety rules and take precautionary actions. Safe practices have been developed from past experience in the use of power source equipment. While certain practices below apply only to electrically-powered equipment, other practices apply to engine-driven equipment, and some practices to both.

2) Shock Prevention

Bare conductors, terminals in the output circuit, or ungrounded, electrically-live equipment can fatally shock a person. Have a certified electrician verify that the equipment is adequately grounded and learn what terminals and parts are electrically HOT. Avoid hot spots on machine. Use proper safety clothing, procedures, and test equipment. The electrical resistance of the body is decreased when wet, permitting dangerous currents to flow through it. When inspecting or servicing equipment, do not work in damp areas. Stand on a dry rubber mat or dry wood, and use insulating gloves when dampness or sweat cannot be avoided. Keep clothing dry, and never work alone.

a) Installation and Grounding of Electrically Powered Equipment

This equipment must be installed and maintained in accordance with the National Electrical Code, ANSI/NFPA 70, or other applicable codes. A power disconnect switch or circuit breaker must be located at the equipment. Check the nameplate for voltage, frequency, and phase requirements. If only 3-phase power is available, connect any single-phase rated equipment to only two wires of the 3-phase line. DO NOT CONNECT the equipment grounding conductor (lead) to the third live wire of the 3-phase line, as this makes the equipment frame electrically HOT, which can cause a fatal shock.

Always connect the grounding lead, if supplied in a power line cable, to the grounded switch box or building ground. If not provided, use a separate grounding lead. Ensure that the current (amperage) capacity of the grounding lead will be adequate for the worst fault current situation. Refer to the National Electrical Code ANSI/NFPA 70 for details. Do not remove plug ground prongs. Use correctly mating receptacles.

b) Output Cables and Terminals

Inspect cables frequently for damage to the insulation and the connectors. Replace or repair cracked or worn cables immediately. Do not overload cables. Do not touch output terminals while equipment is energized.

3) Service and Maintenance

This equipment must be maintained in good electrical condition to avoid hazards stemming from disrepair. Report any equipment defect or safety hazard to the supervisor and discontinue use of the equipment until its safety has been assured. Repairs should be made by qualified personnel only. Before inspecting or servicing this equipment, take the following precautions:

a) Shut off all power at the disconnecting switch or line breaker before inspecting or servicing the equipment.

b) Lock switch OPEN (or remove line fuses) so that power cannot be turned on accidentally.

c) Disconnect power to equipment if it is out of service.

d) If troubleshooting must be done with the unit energized, have another person present who is trained in turning off the equipment and providing or calling for first aid.

4) Fire And Explosion Prevention

Fire and explosion are caused by electrical short circuits, combustible material near this equipment, or unsafe operating conditions. Overloaded or shorted equipment can become hot enough to cause fires by self destruction or by causing nearby combustibles to ignite. For electrically-powered equipment, provide primary input protection to remove short circuited or heavily overloaded equipment from the line.

5) Bodily Injury Prevention

Serious injury can result from contact with live circuit components inside this equipment. Shut DOWN this equipment for inspection and routine maintenance. When equipment is in operation, use extreme care in doing necessary troubleshooting and adjustment.

6) Medical and First Aid Treatment

First aid facilities and a qualified first aid person should be available for each shift for immediate treatment of all injury victims. Electric shock victims should be checked by a physician and taken to a hospital immediately if any abnormal signs are observed.

EMERGENCY FIRST AID	Call physician immediately. Seek additional assistance. Use First Aid techniques recommended by American Red Cross until medical help arrives. IF BREATHING IS DIFFICULT, give oxygen, if available, and have victim lie down. FOR ELECTRICAL SHOCK, turn off power. Remove victim; if not breathing, begin artificial respiration, preferably mouth-to-mouth. If no detectable pulse, begin external heart massage. CALL EMERGENCY RESCUE SQUAD IMMEDIATELY.

7) Equipment Precautionary Labels

Inspect all precautionary labels on the equipment monthly. Order and replace all labels that cannot be easily read.

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Introduction

This manual contains operation and maintenance information for "GPU-400" solid state Transformer-Rectifiers manufactured by Hobart Ground Power, Troy, Ohio 45373.

This manual is not intended to be a textbook on electricity or electronics. Its primary purpose is to provide information and instructions to experienced operators, electricians, and mechanics who have never operated this equipment. It is the intent of this manual to guide and assist operators and maintenance people in the proper use and care of the equipment.

Use of the manual should not be put off until a trouble or need for help develops. Read the instructions before starting the unit. Learn to use the manual and to locate information contained in it. Its style and arrangement are very similar to commercial aircraft manuals.

The manual is divided into five chapters plus an appendix. Each chapter is divided into as many sections as required. Each new section starts with page 1. Each page is identified by chapter, section and page number, which are located in the lower, outside corner. When information located in another portion of the manual is referred to, its location is identified by a chapter, section, paragraph or figure number.

For example: "(see Section 2-3, Paragraph 1.a.)" refers to information located in Chapter 2, Section 3, Paragraph 1.a. If a chapter and section are not indicated in a reference, the referenced material is located in the same section as the reference, for example: "(see Paragraph 1.a.)."

The Appendix is the last section. Its contains a list of available options that may be purchased with that unit. Items on the list with check marks next to them, have been added to the standard unit per the customer's order. Literature for each option follows. The Appendix will help control the information in the manual: making it unique to the unit purchased.

In addition to operation and maintenance instructions, the manual contains an illustrated parts list in Chapter 4, and a collection of manufacturer's literature and supplemental information in Chapter 5.

Contents of the manual is arranged as follows:

Chapter 1. Description/Operation

Chapter 2. Servicing/Troubleshooting

Chapter 3. Overhaul/Major Repair

Chapter 4. Illustrated Parts List

Chapter 5. Manufacturer's Literature

Appendix A Options

If you have any questions concerning your Hobart Ground Power equipment, immediately contact our Service Department by mail, telephone, FAX, or E-Mail.

Write:	Hobart Ground Power Service Department 1177 Trade Road East Troy, Ohio 45373 U.S.A.
Call Inside U.S.A.:	(800) 422-4166 (Parts) (800) 422-4177 (Service)
Call From Foreign Countries:	(937) 332-5050 (Parts) (937) 332-5060 (Service)
FAX Inside U.S.A.	(800) 367-4945
FAX From Foreign Countries:	(937) 332-5121
E-Mail :	service@hobartgroundpower.com
Web Page :	www.hobartgroundpower.com

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Appendix A

Chapter 1 Description/Operation

Section 1 Description

1) General

The GPU-400 Solid State Transformer-Rectifiers covered by this manual are manufactured by Hobart Ground Power, Troy, Ohio 45373. These Transformer-Rectifiers (GPUs) are designed to provide ground power for maintenance and startup of aircraft having 28-VDC electrical systems.

The number 500160 identifies the "model or series" of the GPU. The part number is followed by a dash number, which separates the basic units available. The criteria for input voltages, Amps, and frequencies change with each dash number. Figure 1 uses the part number to identify the variations possible covered by this manual.

Part & Dash Number	Mounting	CE Certified	Input Voltage	Input Frequency	Output Voltage	Output Current
500160-401	Trailer	--	208/230/460	60 Hz.	28.5 VDC	400 A
500160-402	Trailer	--	220/380	50 Hz.	28.5 VDC	400 A
500160-403	Trailer	--	230/460/575	60 Hz.	28.5 VDC	400 A
500160-411	Trailer	Y	208/230/460	60 Hz.	28.5 VDC	400 A
500160-412	Trailer	Y	220/380	50 Hz.	28.5 VDC	400 A
500160-421	Stationary	--	220/230/460	60 Hz.	28.5 VDC	400 A
500160-422	Stationary	--	220/380	50 Hz.	28.5 VDC	400 A
500160-451	Bridge	--	220/230/460	60 Hz.	28.5 VDC	400 A
500160-452	Bridge	--	220/380	50 Hz.	28.5 VDC	400 A

Series 500160 Transformer-Rectifier Part Number Descriptions
Figure 1

2) Optional Equipment - Appendix A

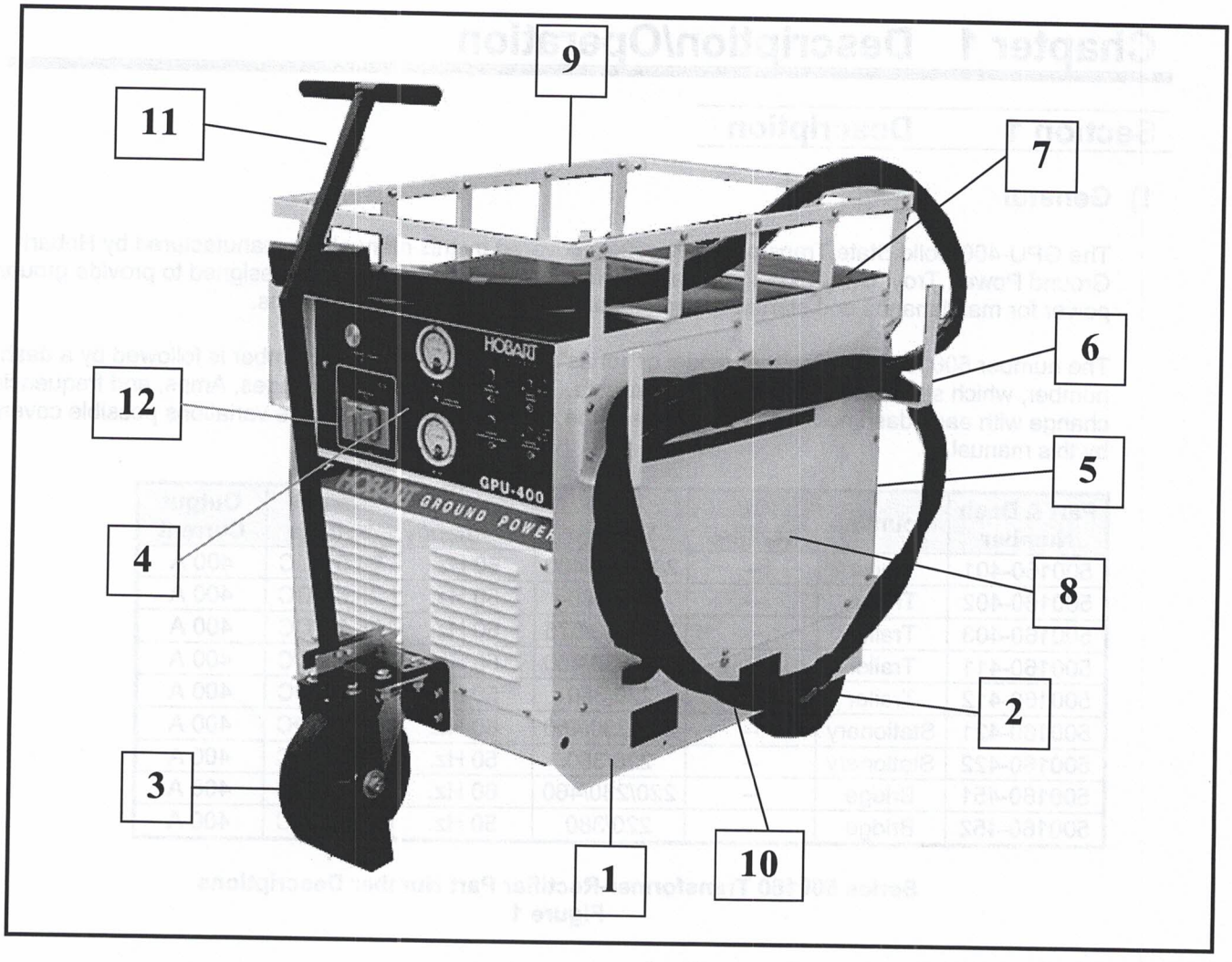
Chapters 1 through 5 of this Operation and Maintenance Manual identifies only the basic version of a Series 500160 GPU. Component differences between the different machines will be listed when necessary. A list of optional equipment, which make this manual unique to the GPU that you have purchased, appears in Appendix A. Examples of items located Appendix A are 14V output kit, cable tray, etc.

3) Orientation

To avoid confusion in the location of components, the control panel is considered to be on the front of the unit. Left and right are determined by looking at the unit from the front.

4) Mounting for the GPU

As a standard, the Transformer-Rectifier GPU-400 is mounted on three wheels, with a caster style front wheel serving as a pivot point for easy maneuverability (i.e. 5th wheel). The GPU-400 can also be mounted stationary or mounted on a boarding bridge with the optional bridge mount bracket.



1. Mounting Base
2. Rear Wheels
3. Front Caster
4. Front/Control Panel
5. Rear Panel [Not Shown]
6. Cable Hanger
7. Top Panel
8. Side Panel (Right Side Shown)
9. Cable Storage Basket [Option Only]
10. Output Cable
11. Pull Handle
12. AC Power Receptacle

General Assembly of GPU-400 Power Supply
Figure 2

ELECTRICAL DATA			
MODEL	6T28-400CL	5T28-400CL	6T28-400CL
SPECIFICATION NUMBER	500160-401	500160-402	500160-403
	500160-411	500160-412	
	500160-421	500160-422	
	500160-451	500160-452	
INPUT			
Voltage	208 / 230 / 460	220 / 380	230 / 460 / 575
Amps	56 / 52 / 26	54 / 32	52 / 26 / 21
Frequency	60	50	60
Phase	3	3	3
Convenience Receptacle	10A / 115V / 60 Hz	10A / 220V / 50 Hz	10A / 115V / 60 Hz
For ground cable size See Section 2, Figure 1			
OUTPUT			
D.C. Voltage	28.5	28.5	28.5
Amps	400	400	400
Duty Cycle	100%	100%	100%
Kilowatts	11.4	11.4	11.4

PHYSICAL / DIMENSIONS					
Model	Length (overall)	Width (case)	Width (overall)	Height (w/o cable basket)	Weight (overall)
Trailer	45.7 inches (116.1 cm)	24.1 inches (61.3 cm)	33 inches (83.8 cm)	35 inches (88.8 cm)	450 lbs. (204 kg)
Stationary	35.1 inches (89.2 cm)	24.1 inches (61.3 cm)	33 inches (83.8 cm)	29.3 inches (74.5 cm)	400 lbs. (181 kg)
Bridge	36 inches (91 cm)	24.1 inches (61.3 cm)	34.4 inches (87.3 cm)	59.8 inches (151.9 cm)	

Specifications and Capabilities
Figure 3

5) Safety Features

The GPU continuously monitors output values and automatically shuts down if a fault occurs in order to minimize risks to the user, the aircraft, and the GPU.

See Sub-section 7, "Detailed Description of GPU-400 Components", for details on the types and levels of protection provided by the control system.

6) Theory of Operation

a) The GPU provides regulated 28.5V DC. Power to the GPU is provided from the local utility company, through the input contactor. The output contactor, controlled by the Output Switch, connects DC power to the load.

The 28V DC power supply consists of a simple and reliable step-down transformer (1, Figure 5) whose output is rectified by six silicon controlled rectifiers (SCRs) (3, Figure 7) in a full-wave, center tapped configuration. A filter consisting of an inductor and capacitors produces a low ripple DC voltage.

The printed circuit board (PC Board) (9, Figure 5) regulates the output voltage by controlling the SCR turn-on. It does this via the phase control method; which uses the SCRs to select the desired portion of the voltage that has been stepped down by the main transformer to produce the DC voltage. The PC Board also provides current limiting, over-voltage and overload protection for loads connected to the DC output. This output is floating (isolated from chassis ground), eliminating any grounding problems between the load and the chassis ground.

b) As an option, the GPU can supply 14 VDC for aircraft requiring that voltage. By design, only one of the output voltages can be supplied at one time. Separate output cables are used for the two voltages for additional protection against the use of the wrong voltage in cases where both 14 VDC and 28 V DC equipment is used. Note that the 31.5 V DC overload trip for both the 14 VDC and 28 VDC output circuits allows a higher percentage overvoltage to a 14 V DC load that to a 28 VDC load.

CAUTION

Capacitor charge can injure! Allow capacitors to discharge and verify capacitor discharge with voltmeter before touching the capacitor circuitry.

7) Detailed Description of GPU-400 Components

a) Front Panel Control Components (See Figure 4)

(1) Front Panel

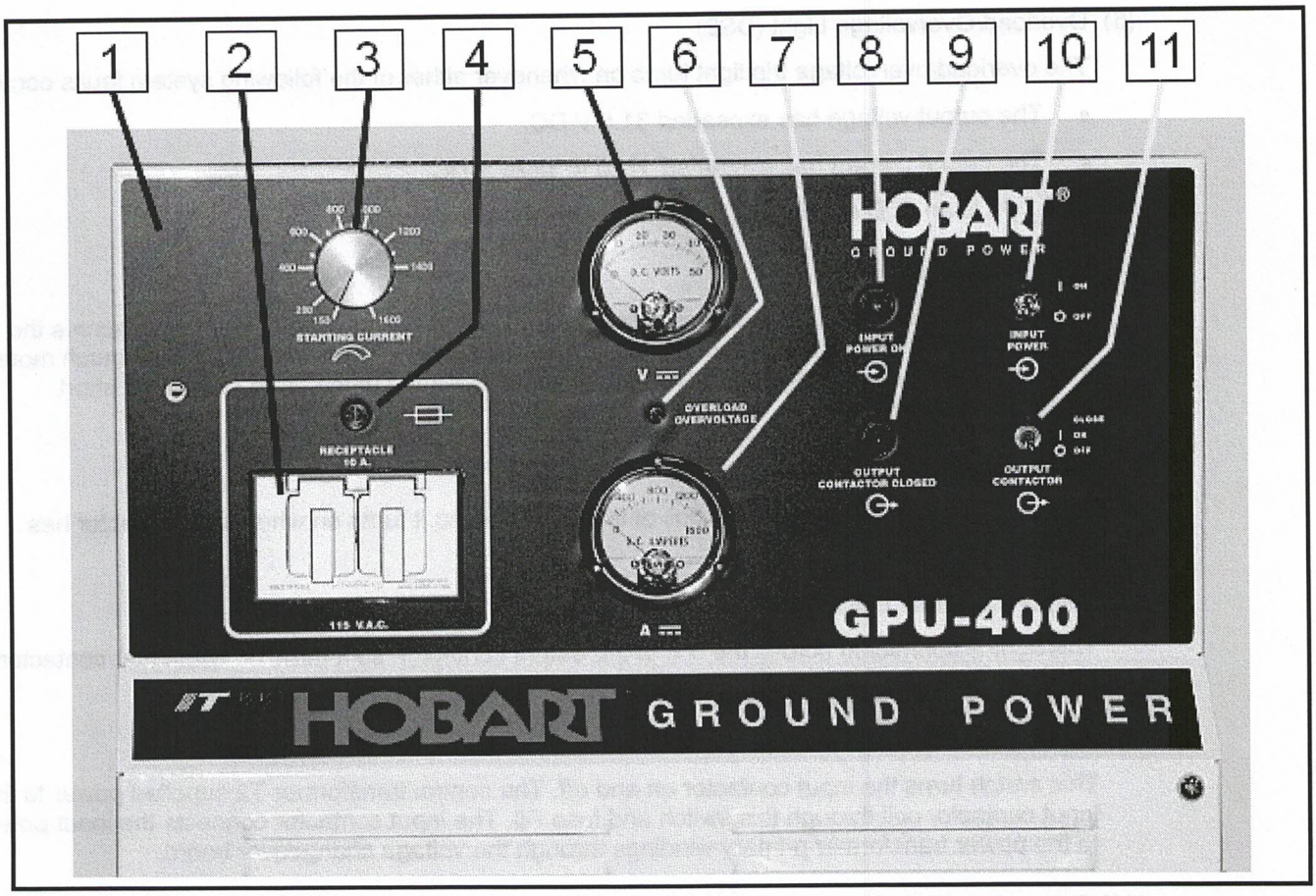
The GPU operator controls mount directly to the front panel.

(2) Convenience Receptacle (J4)

The convenience provides AC power from a secondary winding on the transformer. The output voltage is 115 VAC for the 60 Hz units and 220 VAC for the 50 Hz units.The receptacle has a weather cover and an MOV surge suppressor.

(3) Starting Current Control (R13)

The R13 starting current potentiometer can select any initial or starting current from 150 amperes to a maximum of 1600 amperes. The GPU limits the output current by lowering the output voltage for loads that draw more than the specified current.



1. Front Panel
2. Convenience Receptacle (115 VAC Shown)
3. Starting Current Control
4. Receptacle Fuse
5. DC Voltmeter (M2)
6. Overload/Overvoltage Light (red)
7. DC Ammeter
8. Input Power Light (amber)
9. Output Contactor Light (green)
10. Input Power On-Off Switch
11. Output Contactor Close-On-Off Switch

Front Panel Assembly of GPU-400
Figure 4

(4) Receptacle Fuse (F9)

This front-panel fuse protects the convenience receptacle. It is rated at 10 amps.

(5) DC Voltmeter

The M2 output voltmeter (3, Figure 4) measures the DC output voltage across the main filter capacitors. The scale has a 50 V DC maximum reading.

(6) Overload/Overvoltage Light (DS2)

The overload/overvoltage trip light turns on whenever either of the following system faults occurs:

- The output voltage has exceeded 31.5 V DC.
- The output current has exceeded 1750 to 1825 A DC.

This light is an LED assembly.

(7) DC Ammeter (M1)

The DC ammeter has a 0 to 1600-amp scale. It actually measures the millivolt drop across the R11 ammeter shunt that corresponds to the scale calibration. The scale range is so much more than the rated output because the unit is capable of providing much more current for short durations (engine starts).

(8) Input Power Light (DS1) (amber)

This light is connected across the coil of the contactor, so it turns on when that contactor has been energized.

(9) Output Contactor Light (DS3) (green)

This light is connected across the coil of the output contactor, so it turns on when that contactor has been energized.

(10) Input Power On-Off Switch (S1)

This switch turns the input contactor on and off. The control transformer T2 supplied power to the input contactor coil through this switch and fuse F8. The input contactor connects the input power to the power transformer primary windings through the voltage changeover board.

(11) Output Contactor Close-On-Off Switch (S2)

The S2 output contactor close-on-off switch has a spring loaded up position for the "close" mode, a middle position for "on" mode, and a bottom position for the "off" mode. The output contactor connects the DC output power to the output cable. To turn the output contactor on, move the output contactor switch to the "close" position and then release it to the center "on" position. To turn the output contactor off, move the output contactor switch to the "off" position.

(12) Emergency Stop Switch (CE certified units only – not shown)

This switch is located in the lower right corner of the operator panel. Press to shut off the GPU.

(13) Voltage Selection Switch (optional – not shown) (S103)

As an option, the GPU-400 can be supplied with a 14-volt option. A switch on the front panel selects either 14 or 28 volts. Units with this option have two output contactors and two output cables.

b) Control Circuit Board (9, Figure 5)

The control board mounts inside the GPU, on a steel panel behind the left side panel. This circuit board controls for the following functions:

(1) Electronic Overvoltage/Overload Protection Circuit

The control board turns off the power supply and turns on the DS2 red overload trip light on the front panel if more than 31.5 V DC or 1750 A overload exists. To reset, correct the cause of the condition and then turn the input switch off and back on.

(2) Electronically Controlled Current Limit

The starting current or output surge current is selected by adjusting R13 starting current control on the front panel from the minimum 150 A DC to the maximum 1600 A DC.

CAUTION Excess starting current may cause damage to load, blow fuses or damage the power supply. Contact the factory if you require a current limit lower than the 150 A DC standard minimum limit.

(3) Regulated DC Output Voltages

The voltage value is continuously compared to the actual output. If adequate input voltage exists, deviation from the desired voltage output is corrected by the change in SCR conduction time set by the printed circuit board firing pulse output. This corrective action is done quickly because the control is done electronically with only limited stored energy in the circuitry. Typical response time is about 25 milliseconds.

(4) Thermal Overload Protection

The control board turns off the SCR firing or gate pulses when the S5 overload thermostat (item 18 in Figure 5) opens. The power supply cannot produce any DC output until the S5 thermostat cools enough to automatically reset (close).

c) Main Transformer (1, Figure 5)

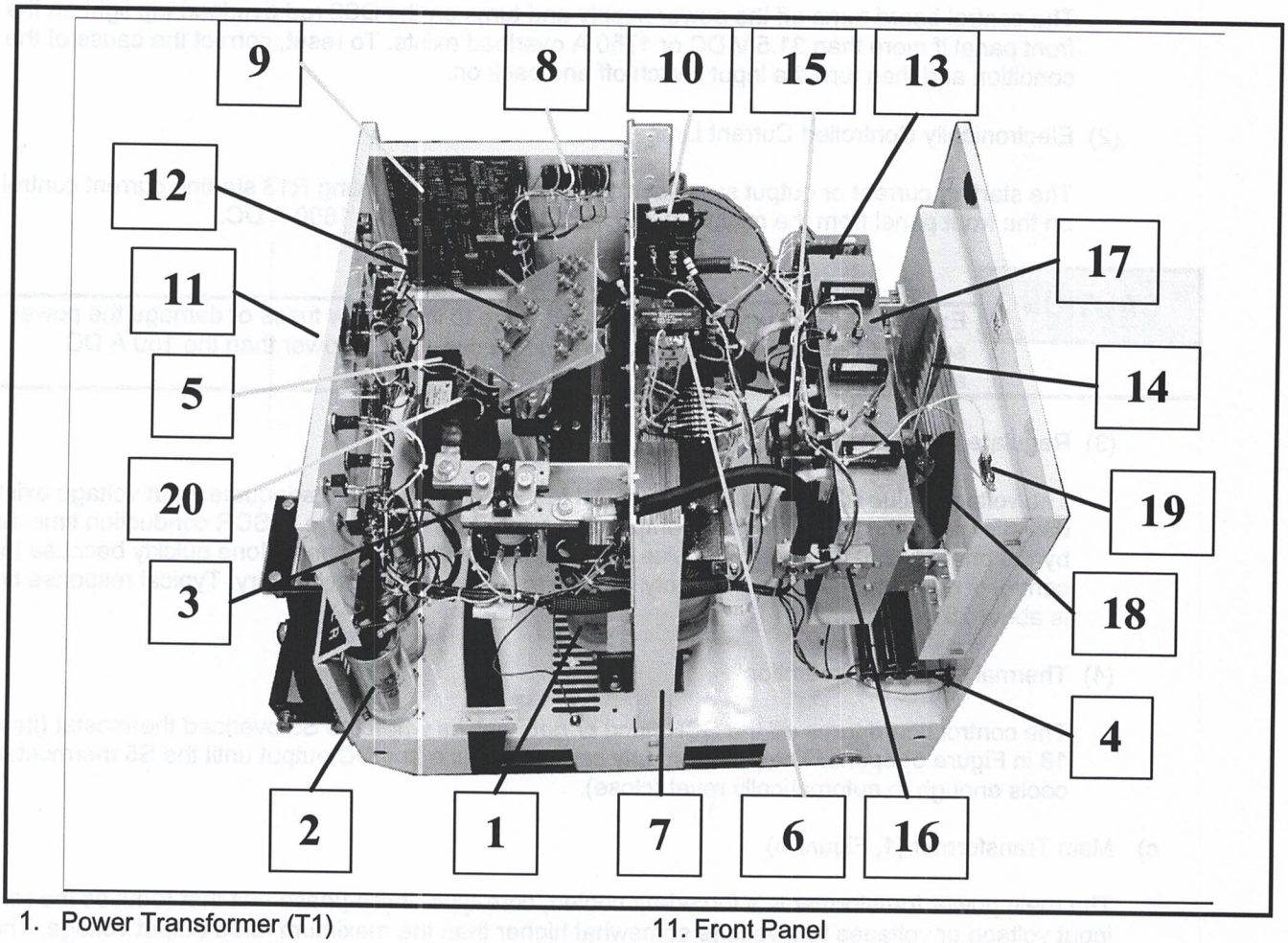
The main power transformer is a forced-air cooled, core-type, three-phase unit that reduces the rated input voltage or voltages to a voltage somewhat higher than the maximum rated output voltage. The extra voltage for the output provides a reserve capability to compensate for undervoltage on the input circuit, for the higher IR voltage drop found as the transformer, cables and other components heat up with load and ambient temperature rises.

The main transformer in the GPU supplies power for the DC output and powers the auxiliary output receptacle and the fan. The main transformers for the 60 Hz. units have windings to provide 115 VAC for the auxiliary power receptacle and fan motor. The main transformers for the 50 Hz. units have windings to provide 220 VAC winding for its auxiliary power receptacle and a 110 VAC winding for the fan motor.

The main transformer has a center tapped coil on each phase that provides six fused (F2-F7) sensing or synchronizing voltage signals to the solid state printed circuit control board (9, Figure 5). Be certain to follow the changeover diagram for both the main transformer and the control transformer (6, Figure 5) for the input voltage you have available.

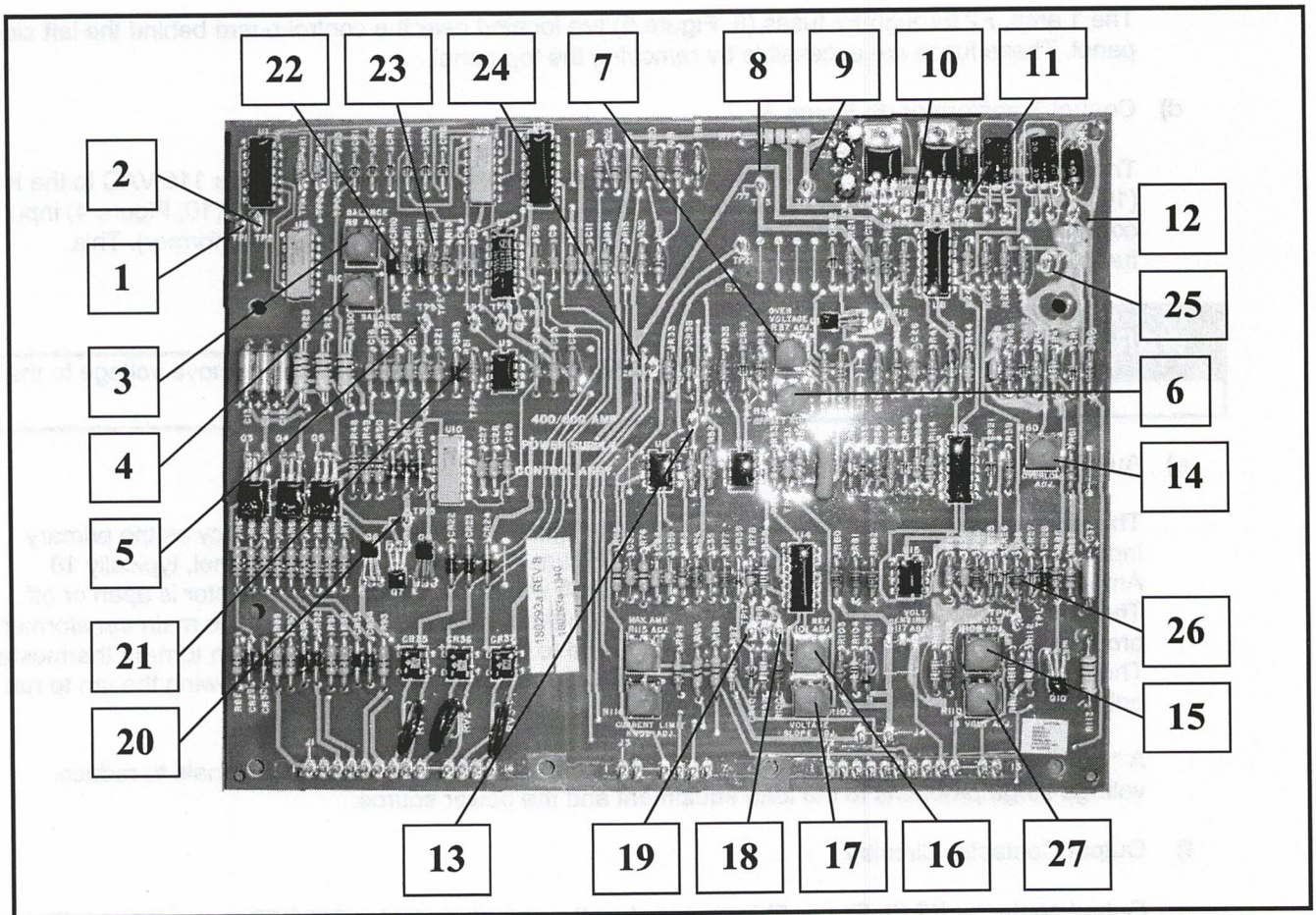
CAUTION

Improper connections will cause damage. Contact factory if your equipment specification information and/or voltage changeover diagram does not agree with your rated 3 phase input voltage.



1. Power Transformer (T1)
2. Capacitors (C15, C16, C17)
3. 28.5 VDC Output Contactor (K2)
4. Pre-load Resistor Assembly (R2, R3, R4)
5. Choke (L1)
6. Control Transformer (T2)
7. Interior Panel
8. Fuse Block (F2 through F7)
9. Printed Circuit Board (A1)
10. Line Contactor (K1)
11. Front Panel
12. Voltage Changeover Board
13. SCR Heat Sink Assembly
14. Fan Blade
15. Fan Motor (B1)
16. Feedback Shunt (R12)
17. Fan Turn-on Thermostat (S4)
18. Overload Thermostat (S5)
19. Fan Fuse (F1)
20. Ammeter Shunt (R11)

Internal Components of GPU-400
Figure 5



1. TP1 SCR Gate Pulse from R10 Adjustment
2. TP2 SCR Gate Pulse from R9 Adjustment
3. R9 Balance Adjustment Phase 2 (TP2)
4. R10 Balance Adjustment Phase 3 (TP1)
5. TP8 Balance SCR Gate Pulse Phase1
6. R38 No Load Amp Off Set Null (TP14)*
7. R37 Over-voltage Trip Point
8. TP3 PC Board Common
9. TP4 +9.1 VDC Timer Voltage
10. TP5 +15 V Regulated Voltage
11. TP6 –15 V Regulated Voltage
12. TP7 +24 V Nonregulated Voltage
13. TP14 Null at 0 A DC TP (R38)*
14. R60 Overload Limit (TP20)
15. R109 28 V DC Output Calibration (TP13)
16. R101 5 V Reference Volt Adjustment (TP19)
17. R102 Voltage Slope Adjustment (TP17)
18. TP19 Reference Volt Test Point (R101)
19. TP17 Voltage Slope Test Point (R102)
20. TP15 Common, PC Board Volts
21. TPF SCR Gate Pulse Timer
22. TPE Gate Timer Output Phase 2
23. TPD Gate Timer Output Phase 3
24. TP13 Actual Output Volt (28.5 or 14.25)
25. TP20 Overload Limit (R60) Adjustment
26. TPL Overload Trip Summing Point
27. R110 14 V DC Output Calibration (TP13)

* Note TP14 provides amplified load amp reading for comparison with overload limit (TP20) and starting amperage limit (TP21) set by R13 control on front panel.

Solid State Printed Circuit Control Board Test Points of GPU-400
Figure 6

The 1 amp, F2 through F7 fuses (8, Figure 5) are located near the control board behind the left side panel. These fuses are accessible by removing the top panel.

d) Control Transformer (6, Figure 5)

The small control transformer located on the interior panel (7, Figure 5) provides 115 VAC to the K1 (10, Figure 5) input contactor coil, input contactor light A (12, Figure 4), and S1 (10, Figure 4) input contactor switch via the half amp F8 contactor fuse (located on the control transformer). This transformer does not provide the 9A, 115 VAC auxiliary power.

WARNING

Electric shock can kill! Disconnect input power at the source to remove voltage to the control transformer, input fuses and contactor.

e) Auxiliary Power Circuitry

The single-phase auxiliary power receptacle (2, Figure 4) has the same frequency as the primary input voltage. It is protected by the F9 fuse (4, Figure 4), located on the front panel, typically 10 Amperes. The auxiliary power circuitry is turned off whenever the primary contactor is open or off. The auxiliary power winding is typically located on the middle leg (B phase) of the main transformer. It provides power to the receptacle (5, Figure 4) and to the fan motor via the S4 fan turn-on thermostat. The fan thermostat saves energy and reduces internal dust accumulation by allowing the fan to run only when necessary to prevent overheating.

A "MOV" voltage surge suppressor, RV1, is installed across the receptacle terminals to reduce voltage surge problems to the load equipment and the power source.

f) Output Contactor Circuitry

Output contactor K2 (3, Figure 5) is operated by the output contactor ON-OFF switch S2 (11, Figure 4). Placing this switch momentarily in the TOP (spring-loaded) position turns the output contactor ON, and placing it in the DOWN position turns the output contactor OFF.

The positive output lead is to be connected to the positive output terminal of the K2 contactor. The negative output lead is to be connected to the R11 ammeter shunt. A small notch has been made in the bottom of the right and left side panels to allow the output cable assembly to pass out either side.

The S5 normally-closed overload thermostat (18, Fig. 5) mounted on the main SCR rectifier heatsink is designed to remove the output command signal whenever the heatsink temperature rise becomes too high from overload, loss of cooling air flow, etc. The thermostat automatically resets on cool down.

g) Output Filter Circuitry

The DC output voltage is smoothed (filtered) by an L-C filter made up of L1 iron core reactor (4, Figure 5) carrying the output current to the load and the ripple current to the C15, C16, C17 capacitors (2, Figure 5) in parallel with the load terminals. The R2, R3, R4 bypass resistors (4, Figure 5) provide both a pre-load to the SCR devices and a safety discharge circuit for quickly discharging the filter capacitors whenever the power supply is turned off.

Note: The 50 Hz. units have an additional capacitor in this circuit.

Note: The 50 Hz. units have an additional capacitor in this circuit.

CAUTION Capacitor charge can injure. Be sure capacitors are discharged before touching.

The CR7 flyback diode (9, Figure 7) acts to facilitate discharge of the output filter circuitry as well as to protect the main SCR rectifier assembly from damaging reverse voltage spikes.

h) Main SCR Heat Sink Assembly (See Figure 7)

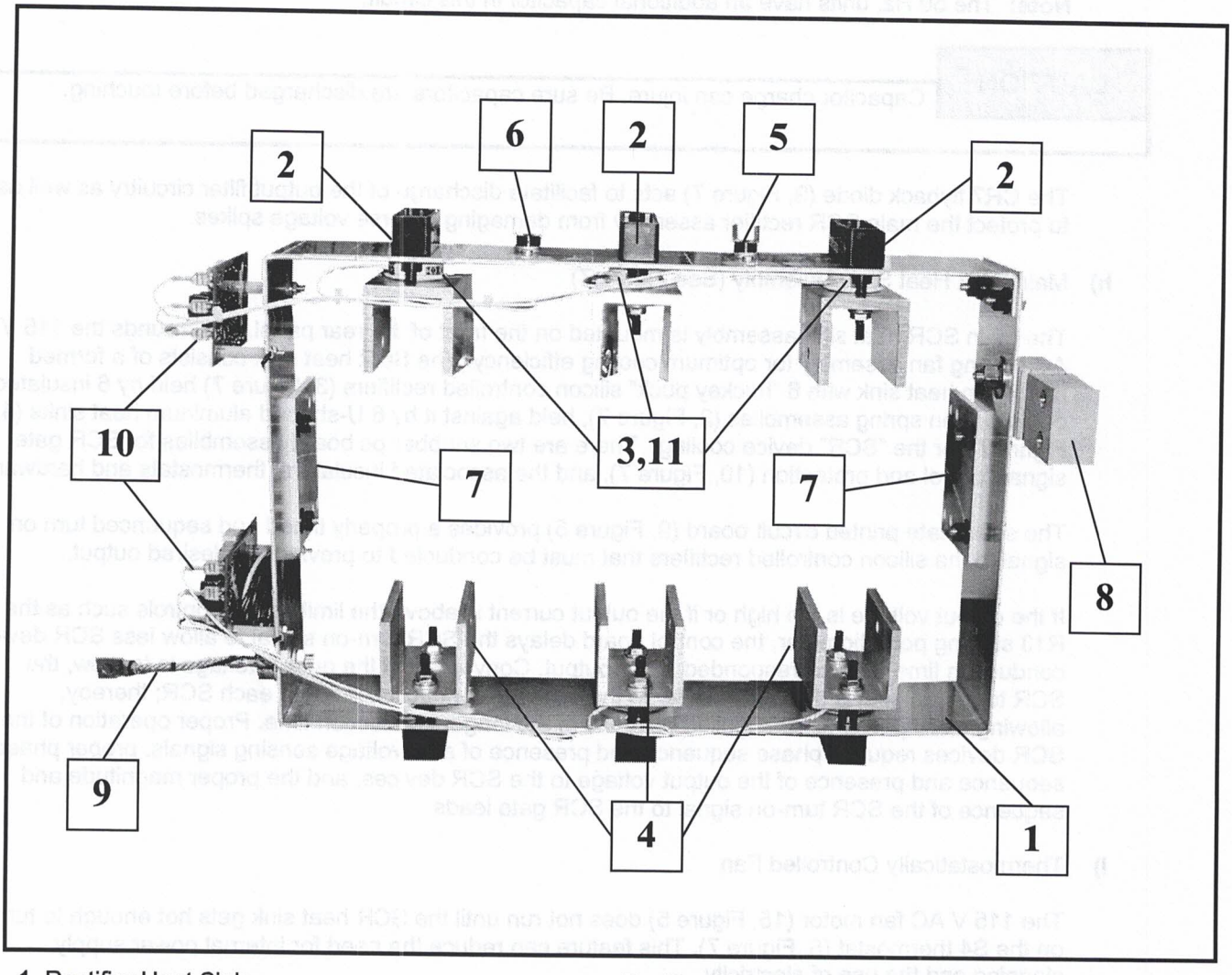
The main SCR heat sink assembly is mounted on the front of the rear panel. It surrounds the 115 V AC cooling fan assembly for optimum cooling efficiency. The SCR heat sink consists of a formed aluminum heat sink with 6 "hockey puck" silicon controlled rectifiers (3, Figure 7) held by 6 insulated compression spring assemblies (2, Figure 7), held against it by 6 U-shaped aluminum heat sinks (4, Figure 7) for the "SCR" device cooling. There are two snubber pc board assemblies for SCR gate signal control and protection (10, Figure 7), and the associated insulators, thermostats and hardware.

The solid-state printed circuit board (9, Figure 5) provides a properly timed and sequenced turn on signal to the silicon controlled rectifiers that must be conducted to provide the desired output.

If the output voltage is too high or if the output current is above the limit set by controls such as the R13 starting potentiometer, the control board delays the SCR turn-on signal to allow less SCR device conduction time for a corresponded lower output. Conversely, if the output voltage is too low, the SCR turn-on signal is delivered earlier in the possible conduction time for each SCR; thereby, allowing more power to be supplied because of the longer conduction time. Proper operation of the SCR devices requires phase sequence and presence of all 6 voltage sensing signals, proper phase sequence and presence of the output voltage to the SCR devices, and the proper magnitude and sequence of the SCR turn-on signal to the SCR gate leads.

i) Thermostatically Controlled Fan

The 115 V AC fan motor (15, Figure 5) does not run until the SCR heat sink gets hot enough to turn on the S4 thermostat (6, Figure 7). This feature can reduce the need for internal power supply cleaning and the use of electricity.



1. Rectifier Heat Sink
2. SCR Mounting Clamp
3. Silicon Rectifier (CR1 through CR6)
4. SCR Heat Sink
5. Overload Thermostat (S5)
6. Fan Turn-on Thermostat (S4)
7. Rectifier Mounting Insulator
8. Feedback Shunt (Not Shown) (R12)
9. Positive Base Silicone Diode (CR7)
10. Surge Suppressors (A2, A3)
11. Pin Spring

SCR Heat Sink Assembly of GPU-400
Figure 7

Section 2 Preparation for Use, Storage, or Shipping

1) Receipt and Inspection of Equipment

The GPU has been thoroughly inspected and tested at the factory and prepared for shipment in accordance with standard industrial practices for safe shipment. Upon receiving this equipment, inspect it as follows.

a) Visually inspect the shipping crate for damage. If any damage is detected, request that the carrier agent inspect the shipment and note the damage on the delivery receipt. This is for your protection.

b) If there is no obvious damage to the shipping crate, unpack the unit as follows:

2) Unpacking the Unit

a) Remove the crate. Take care to avoid damage to the equipment if bars, hammers, etc. are used in unpacking. Remove all unused hardware from the unit.

b) Visually inspect the unit for evidence of external damage such as damaged sheet metal, scratches, dents, etc. Check also for loose connections and components. If the equipment has been damaged in transit, file a claim for damage at once. If you require assistance with a damage claim, furnish Hobart Ground Power with full information about the claim.

NOTE: Save the shipping container until the unit has been put into service and determined to be operating correctly.

3) Operating Location Selection

For best operating characteristics and longest unit life, select an installation site that is not exposed to high humidity, dust, high ambient temperature, flooding, or corrosive agents. Moisture can condense on electrical components, causing corrosion or shorting circuits. Dirt on components helps retain this moisture in addition to providing a conducting material.

Adequate air circulation is needed at all times in order to assure proper operation. Provide a minimum of 12 inches (305mm) of free air space at both the front and rear of the unit. Make sure that the ventilator openings are not obstructed. The unit should not be installed on a grade greater than 10°.

4) Input Cable Selection

Figure 1 shows input cable size requirements for GPU units covered by this manual. This information is from the U.S. National Electrical Code ANSI/NFPA 70. Install this equipment per the latest edition, available from the National Fire Protection Association (www.nfpa.org). The customer must also furnish a suitable means to safely disconnect power from the GPU.

The GPU has a large inrush current when it is first turned on, much like a large electric motor. Therefore, to avoid falsely tripping the supply line circuit breaker, the breaker should be the type used with electric motors.

LINE VOLTS	RATED CURRENT	COPPER LINE WIRE SIZE	
		In Conduit (*)	In Flexible Cable (**)
208	59	No. 6	No. 6
220	56	No. 6	No. 6
230	54	No. 6	No. 6
380	32	No. 8	No. 8
460	27	No. 10	No. 8
575	21	No. 12	No. 8

* Conductor sizes listed are for 30 feet or less of each conductor in conduit and for **copper** conductors having **90° C insulation**, such as type **FEB, FEPB, RHH,** and **THHN** as based on an ambient temperature of 50° C. For conductors having other insulation, or for conductors longer than 30 feet, consult **Hobart Ground Power** for the required conductor size.

** Conductor sizes listed are for 30 feet or less of each conductor in conduit and for **copper** conductors having **90° C insulation**, such as type **W, SC, SCE, SCT, PPE, G,** and **G-GC** as based on an ambient temperature of 50° C. For conductors having other insulation, or for conductors longer than 30 feet, consult **Hobart Ground Power** for the required conductor size.

Recommended Wire Size
Figure 1

5) Installation

A Hobart GPU requires no additional preparation in order to supply power to an aircraft. It needs only to have its input cable connected to an appropriate source of power and its output cable connected to an aircraft. Proceed as follows for putting the GPU unit into service.

WARNING

The method of installation, conductor size, and over-current protection shall conform to the requirements of the local electrical code, the national electrical code, or other national codes, as applicable. Qualified persons shall do all installation wiring and machine reconnection.

a) Locate the Cable Entry Locations

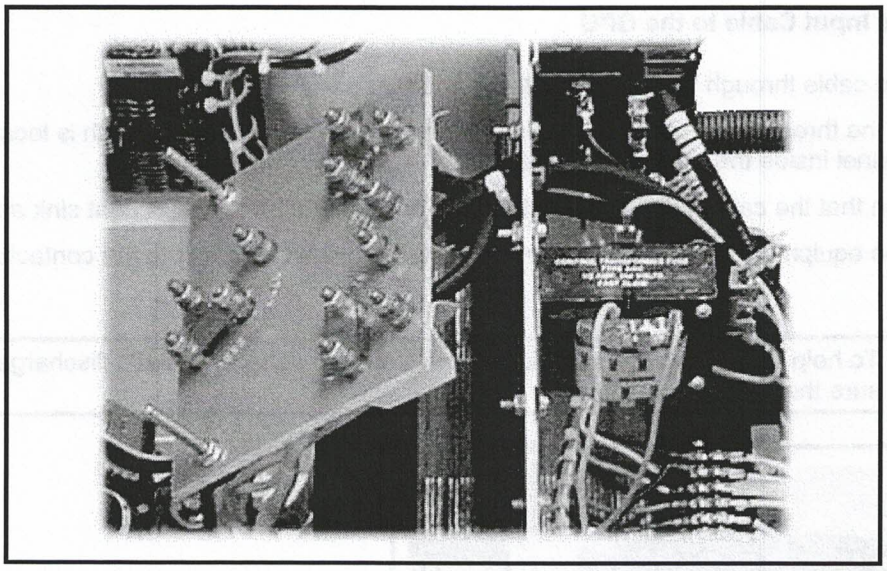
Input and output cable entrance shall be made through the cable entrance holes provided in the GPU cabinet. Consult our Service Department if problems arise.

The GPU has an 1.75" diameter entry hole for the input cable on the rear of the unit. The customer is responsible for supplying a suitable cable clamp.

The GPU canopy has slots on the side for the output cable. A cable clamp holds the output cable to the unit base.

b) Verify the Input Voltage Configuration

The GPU may be configured for various input voltages, depending on the specific model (specification number). The factory pre-configures each unit before shipment according to the customer specifications for the input voltage. While the GPU is open for connecting cables, verify the voltage configuration. Figure 2 shows the interior panel as viewed from the right side of the GPU.



Input Voltage Configuration Locations
Figure 2

On the left is Voltage Changeover Panel, which sets the input voltage for the main transformer. On the right is the control transformer, which has different taps for the various input voltages.

(1) Make sure the GPU is not connected to the electrical service.

(2) Remove the top cover.

(3) Locate the items pictures in Figure 2.

(4) Refer to Sheet 6 of the schematic diagram, which is located in Chapter 5 of this manual.

(5) Verify that the configuration matches the appropriate diagram on the schematic.

CAUTION

Reconnection of control transformer as well as main input connection panel must be made when changing rated input voltage. See changeover diagram.

Changing the voltage configuration requires changes to main transformer T1 configuration on the Changeover Board and changes to control transformer T2 by moving a yellow wire to a different tap on the right side of the transformer.

If it is necessary to change the configuration, follow these steps:

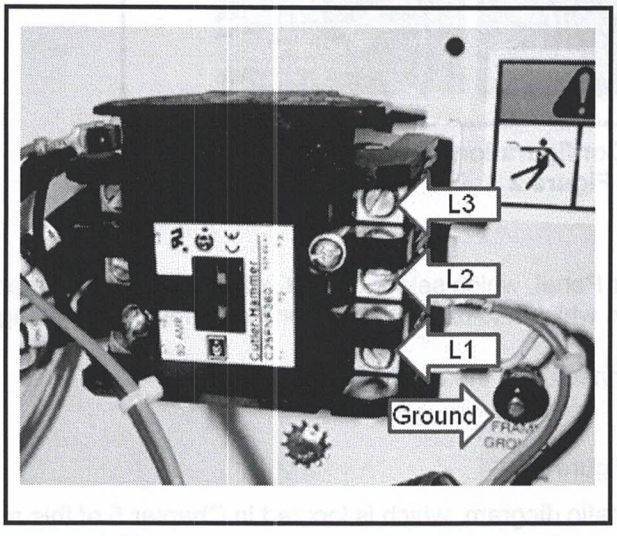
(1) On the T1 Changeover Board, move the jumper links as shown on the diagram for your voltage requirement.
(2) On the right side of control transformer, move the yellow wire to the tap specified in the diagram.

c) Connect the Input Cable to the GPU

(1) Route the cable through the hole provided in the rear panel.
(2) Connect the three-phase line leads to input terminals on line contactor, which is located on the interior panel inside the power supply cabinet.
(3) Be certain that the cable will not contact the fan or hot parts on the SCR heat sink assembly.
(4) Attach the equipment ground conductor to the stud provided adjacent to the contactor.

WARNING

To help protect against electrical shock from line voltage or static discharge, make sure the GPU is grounded.



Input Contactor
Figure 3

NOTE: After connecting the input cables, it is recommended that Hobart # 904021 urethane coating be sprayed on the connections at the contactor to protect these connections from corrosion, fungus, and contamination. Spraying these connections will also reduce the potential for arcing from dirt and condensation.

d) Connect the Input Cable to the Utility Service

Before connecting input cables to the power supply service, check voltage, amperage and phase ratings of the service. Make certain that the capacity of the service is adequate for the power requirements of the unit being connected to it. Make certain that the service used, as the source of

input power, is grounded. Refer and conform to your local electrical code when selecting and installing power supply service.

(1) Make sure electrical service is off.

(2) Connect the input power cables to the input power source.

(3) Connect the grounding conductor to a proper ground.

(4) Leave the electrical service turned off.

e) Connect the Output Cable

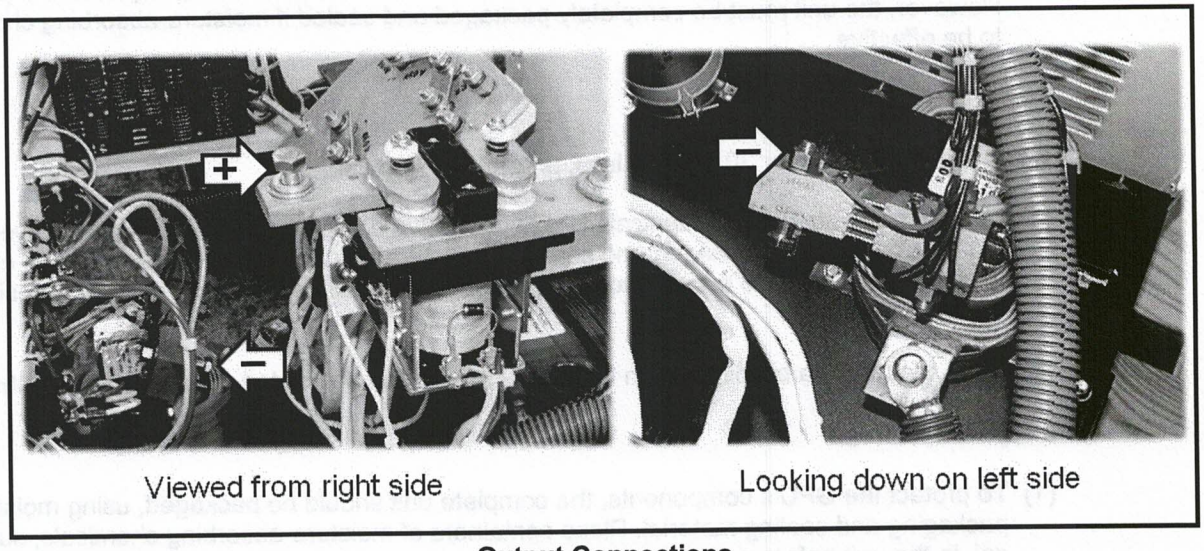
Wheel-mounted GPUs are generally shipped with the output cable already installed. For bridge-mount or stationary GPUs, the customer must supply and connect the output cable. To connect the output cable, follow these steps:

(1) Route the cable through the side panel and under the cable clamp.

(2) Connect the positive output lead to the positive output terminal of Output Contactor K2.

(3) Connect the negative output lead to Ammeter Shunt R11.

(4) Tighten the cable clamp.



Output Connections
Figure 4

f) Check GPU No-Load Operation

A no-load check should be made before the GPU is connected to an aircraft. Proceed as follows.

(1) Replace the top panel.

(2) Apply input power to the GPU from the input power source.

(3) On the front panel of the GPU, turn on the input power switch.

(4) Verify that the amber input power light turns on.

(5) Hold the output contactor switch up in the "Close" position until the green output contactor light turns on.

(6) Release the output contactor switch to the middle "On" position.

(7) Verify that the voltmeter shows the proper voltage.

(8) Using a handheld voltmeter, verify that voltage is present at the aircraft connector.

(9) Turn off the GPU.

The unit is now available for regular service.

6) Preparation for Storage

a) General

(1) The unit should be prepared for storage as soon as possible after being removed from service.

(2) The unit should be stored in a building which is dry and which may be heated during winter months. The unit shall be stored on a grade no greater than 10°.

(3) Moisture absorbing chemicals are available for use where excessive dampness is a problem. However, the unit must be completely packaged and sealed if moisture-absorbing chemicals are to be effective.

b) Temporary Storage

When storing the unit for 30 days or less, prepare as follows:

(1) Use moisture-absorbing chemicals where excessive dampness is a problem. However, the unit must be completely packaged and sealed if moisture-absorbing chemicals are to be effective. Seal all openings. Use a waterproof, vapor proof material that is strong enough to resist puncture damage.

(2) Store the unit in a building which is dry and which may be heated during winter months.

c) Long Time Storage

(1) To protect the GPU's components, the complete unit should be packaged, using moisture proof packaging and sealing material. Place containers of moisture-absorbing chemicals, such as silica gel, in the unit before packaging.

(2) Store the unit in a building which is dry and which may be heated during winter months.

7) Preparation for Shipment

During long shipments, vibration, jolting, etc may loosen the GPU unit's retaining hardware. Check this hardware periodically during the shipment to make certain that retaining hardware is secure.

HOBART GROUND POWER

Section 3 Operation

IMPORTANT Before attempting to operate the converter, read this entire section to become fully familiar with how the converter operates.

1) General

This section contains information for safe and efficient operation of the equipment. Operating instructions are presented in step-by-step sequence of procedures to be followed in supplying 28 V DC to an aircraft or similar load.

WARNING Electric shock and fire can kill! Read and understand all operating instructions before attempting to operate the equipment. Operation attempts by untrained personnel can endanger people, this equipment, and the load. Do not attempt to operate the equipment for uses not approved by the manufacturer, or at input and output ratings not listed in the specification table located in 1-1, Figure 3.

The repeated opening of input fuses or repeated functioning of the overload trip circuitry indicates a misapplication, a faulty main component, or an improper connection or load. Correct the problem by following the instructions in Chapter 2 before attempting to operate the power supply. Be certain that a input disconnect means is readily accessible between the power input source and this DC power supply. You may need to quickly isolate the DC power source from all power during an emergency, fire, or equipment malfunction.

2) Operation Preparation

a) Verify input power is disconnected at source.

b) Verify that the supply-input connections agree with the input voltage available by comparison to the voltage changeover diagram.

c) Connect output cable between load and the proper connection points in the DC power supply.

d) When all covers or panels are in place, turn on the source of input power.

e) Set R13 start level control knob (1-1, 8, Figure 4) to the output surge limit required for your load.

3) Operation Procedure

a) Input Control Functions

(1) Turn on S1 input contactor switch (1-1, 10, Figure 4).

(2) Verify that only the amber input power light (1-1, 12, Figure 4) glows. If the light glows, no problems exist requiring service.

b) Output Control Functions

(1) Hold the S2 output contactor switch (1-1, 11, Figure 4) in the up "CLOSE" position long enough for the green output contactor light (1-1, 13, Figure 4) to glow.

(2) Release S2 switch to the middle "ON" position.

(3) Verify that M1 DC ammeter (1-1, 2, Figure 4) does not read excessive amperage.

(4) The DC power supply should continue to deliver power until the S2 switch is placed in the down "OFF" position or one of the other control functions turn the unit "OFF".

4) Voltmeter

a) Verify on the M2 DC voltmeter (1-1, 3, Figure 4) that the DC output voltage level is correct. If not, turn off power supply, disconnect your load, and refer to Service, Chapter 2 for instructions.

5) Output Current Limit

a) If the DC ammeter continuously reads more than 400 A DC after start-up, immediately turn R13 current limit control (1-1, 8, Figure 4) down to continuous operation current point, normally 400 A DC. This may prevent input fuse blowing and automatic overload trip out.

b) If R13 has no effect or if the output current cannot be decreased to about 150 A DC at the R13 minimum position, a faulty SCR device or control circuit malfunction is indicated requiring power supply repair. Refer to Chapter 2 for service instructions.

Chapter 2 Servicing / Troubleshooting

Section 1 Troubleshooting

1) General

The troubleshooting information provided in this section is limited to procedures for determining the cause of faults and for restoring the GPU to operation after faults develop which shut off the unit.

Calibration, service, and repair are to be done by Hobart Ground Power Service Department personnel, authorized distributors of Hobart Ground Power equipment, or trained qualified electronic technicians.

If you have any questions concerning your Hobart Ground Power, contact our Service Department by mail, telephone, FAX or E-Mail.

Write:	Hobart Ground Power Service Department 1177 Trade Square East Troy, Ohio 45373 U.S.A.
Call Inside U.S.A.:	(800) 422-4166 (Parts) (800) 422-4177 (Service)
Call From Foreign Countries:	(937) 332-5050 (Parts) (937) 332-5060 (Service)
FAX Inside U.S.A.	(800) 367-4945
FAX From Foreign Countries:	(937) 332-5121
E-Mail :	service@hobartgroundpower.com
Web Page :	www.hobartgroundpower.com

2) Troubleshooting

a) Description

The troubleshooting chart lists information under three headings:

- Trouble, symptom, and condition
- Probable cause
- Test, check, and remedy

a) Use of the Troubleshooting Chart

The troubleshooting chart is designed to provide maintenance and repair personnel with a timesaving guide for locating the source of trouble.

(1) Terminal points (reference applicable schematic and connection diagrams) provide easily accessible and identifiable test points for checking circuits and electrical components.

(2) Test points are located throughout the circuitry in such a manner that input and output power may be used for test purposes. Because of these test points and their location, a complete check of circuitry may be completed very quickly. Therefore, "probable causes" and "remedies" are listed in a step-by-step sequence which will insure power for testing in all instances where input or output power may be used with proper safety practices, test equipment, and training experience.

(3) Printed circuit board output troubles should be pinpointed only to determine if the problem is a board calibration problem or a PC board failure problem. Failure of PC board requires replacement of the board. Field repair attempts are not recommended.

(4) Always check circuit fuses, circuit breakers and the position of switches first in troubleshooting. The incorrect positioning of a switch may cause a condition that could be misinterpreted as a fault.

(5) Electrical component reference designators (such as S1, K2, R10) may be used in the troubleshooting chart (in parentheses after the item name) to help maintenance personnel identify parts on the schematic diagrams.

3) Equipment for Troubleshooting

For basic troubleshooting, use a good quality multi-scale volt-ohmmeter (VOM). Troubleshooting erratic, intermittent, or phase relationship problems requires a good oscilloscope with an isolated neutral connection.

WARNING

High voltage - electric shock and fire can kill! Exercise extreme care to avoid contact with high voltage leads and components that could cause serious shock and injury if touched when troubleshooting or operating the equipment. Stay clear of moving parts. Locate equipment in a safe environment. Have proper safety equipment available. Do not attempt operation or repair without adequate training.

4) Voltages of Interest

a) Across the secondary on all 3 phases - 66 VAC ± 10% *

b) To secondary coil center tap on all phases - 33 VAC ± 10% *

* The ± 10% refers to the possibility of input voltage being out of balance or not at the nominal value.

c) Across the 115 VAC receptacle - 115 VAC *(230 VAC on 50hz units)* ± 10% *

d) Between X1 and X3 on Fuse Block - 37 VAC ± 10% *

e) Test Point Values for PC board

A control board malfunction will probably result in one or more of the following symptoms:

- loss of output voltage
- inability to produce full load current
- output voltage too high or too low

Section 2-2 shows the circuit board test points and provides standard voltages at those points.

NOTE: The circuit board potentiometers are preset at the factory and should not have to be reset in the field. If a need arises that would indicate the need for field adjustments, please contact the factory. The only exceptions are R109 and R110, which adjust the 28 V and 14 V output levels, respectively. If necessary, use these controls to increase the output voltages slightly to compensate for the voltage drop in long output cables.

5) SCR Malfunction Instructions

a) SCR Failure Symptoms

SCR failure is not common. When they do fail, they generally do so either by shorting or by failing to turn on.

- Shorted SCRs will generally result in tripping the circuit breaker at the power source. However, a shorted fly-back diode (on the filter choke input or across the output contactor coil) may also trip the breaker. This is a severe malfunction.
- If an SCR does not turn on, it may be because it is open or because the gate signal from the control board is not reaching the SCR.
  - If one SCR does not turn on, a very small change will occur at the output, which will be difficult to notice. The ripple voltage at the output will increase.
  - If two SCR's do not turn on, the ripple current will increase and can cause other problems. (consult troubleshooting procedure).

b) Troubleshooting Shorted SCRs and Diodes

WARNING

Electric shock and fire can kill!

- Do not touch energized parts. Always turn off utility power to the unit before touching anything inside.
- Do not leave the GPU on long enough to overheat or fail in the faulty condition.

(1) Turn off the unit and turn off the input power at the utility source.

(2) Disconnect the leads from the transformer to the heat sink assembly.

(3) Wrap each disconnected transformer lead with electrical tape. Mark each lead to identify it so it can be reconnected to its proper location.

(4) Check the SCRs and fly-back diodes with the ohmmeter to located shorted devices.

(5) With the SCRs and fly-back diodes disconnected, apply power to the unit. Make sure that the other components are not the cause of the tripped breaker.

(6) If no problems have been found, check for a device that only breaks down to a shorted condition when voltage is applied by reconnecting one device at a time.

c) Troubleshooting Excessive Output Ripple

An open gate or an open SCR cannot be checked with a VOM. If an SCR is not firing, the AC ripple current will increase across the filter capacitors, but that will not blow fuses.

Follow these steps to locate a bad SCR:

(1) Connect an oscilloscope across the unfiltered output:

- Connect the probe of an oscilloscope to the heat sink
- Connect the isolated neutral of the oscilloscope to the braid of the fly-back diode.

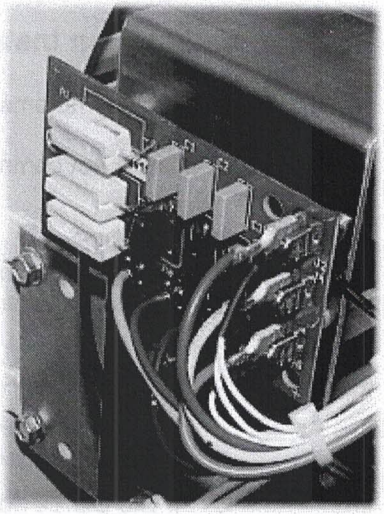
The output should appear as six evenly spaced pulses of about the same height. If an SCR is not firing, one of the pulses will be missing.

Note: if every third pulse is low or missing, check the balance adjustments, R9 and R10, before attributing the problem to faulty components.

(2) Disconnect the gate lead for one SCR from the applicable suppressor board. If the lead disconnection does not affect the output waveform, that is probably the bad SCR.

(3) If that SCR was not the source of the problem, reconnect the gate lead.

(4) Repeat for other SCRs, one at a time, until the defective device is located.



Gate Lead Connections

Figure 1

6) Troubleshooting Tables

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
Machine Will Not Operate		
1. Machine will not start	**a.** The input power is turned OFF at remote disconnect switch	Turn the power ON at remote disconnect switch.
	b. Blown fuse in remote disconnect switch	Replace blown fuse. If fuse blows frequently, determine and remedy the cause.
	c. Incorrect input power connections at machine	Check input power connections against appropriate connection diagram in Chapter 5.
	d. Incorrect power input (frequency and voltage)	Check that voltage and frequency of power input for this ground power unit, according to the rating on its nameplate.
	e. Broken input cable	Repair cable as necessary.
2. Line contactor fails to close	**a.** Line contactor fuse F8 blown	Replace fuse. Check for cause if fuse blows frequently.
	b. Mechanical obstruction on contactor	Remove obstruction.
	c. Defective line contactor switch	Replace line contactor switch.
	d. Defective coil in line contactor	Replace contactor if coil is open or shorted.
	e. Cable broken at line contactor	Repair broken cable as necessary.
3. Line contactor chatters	**a.** Input cables too small or too long	Use input cables of sufficient capability for proper operation of the machine. Refer to Section 1-2, Figure 1 for proper cable size to be used.
	b. Faulty contactor coil	Check coil voltage. If correct, replace contactor.
	c. Low line voltage	Check line voltage. Correct problem as necessary.

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
Machine Will Not Operate, continued		
4. Contactor operates and trips power source circuit breaker	**a.** Wrong line voltage	Check nameplate of machine for line voltage to be used. Then measure line voltage. If line voltage is of improper value, correct this condition as is necessary to provide proper voltage input to the machine.
	b. Breaker incorrect size or type	Refer to Section 1-2, Figure 1 for input current requirements. Make sure the breaker is appropriate for a high inrush current – use a breaker designed for motor starting applications.
	c. Links on voltage changeover board incorrectly connected	Check appropriate voltage changeover diagram in Chapter 5 for proper link positions. Make correction as necessary.
	d. SCR failure or shorted fly-back diode	Refer to detail troubleshooting instructions.
	e. Short circuit in primary connections	Remove short circuit.

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
Unit Turns Off After Starting		
1. Unit delivers power but soon shuts down (Thermal overload, electronic overload or over-voltage circuit trips)	**a.** Power supply overloaded	Reduce load, overload can be carried only for a short time.
	b. Duty cycle too high	Do not operate continually at overload currents.
	c. Ambient temperature too high	Operate at reduced loads when temperature exceeds 104° F (40° C) or improve cooling ambient.
	d. Ventilation blocked	Check that air intake and exhaust openings are not obstructed.
	e. Fan not operating	Check fuse F1 on the fan shroud. If it is good, disconnect the fan motor leads and apply 115 VAC directly to fan motor. Replace fan motor if it fails to operate or if its bearings are defective.
	f. Shorted output	Reset electronic overload.
2. Over-voltage/Overload trip malfunction is in unit's internal circuitry.	**a.** Control circuit board failure	Refer to detail troubleshooting instructions.
	b. Loose connections in voltage control circuit	Check for loose connections. Tighten and secure as required.
	c. Starting current potentiometer (R13) open	Replace potentiometer.
3. Fan not operating (also see causes and remedies under "Machine will not start")	**a.** Blown fuse (F1)	Replace fuse.
	b. Fan control thermostat defective	Place a jumper wire across the overheated thermostat. If fan then runs, replace thermostat.
	Note: A properly operating fan thermostat will turn on the fan at 100°F and keep the fan running until 80° F is reached at heat sink.	
	c. Broken lead or connection to fan motor	Repair wiring as necessary.
	d. Fan motor defective	Disconnect fan motor leads and apply 115 VAC directly to fan motor. If it fails to operate, replace it.

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
Voltage on GPU Case		
1. Operator gets shock when machine case is touched	a. Case of machine not grounded	Ground machine case to an earth-type ground if utility ground is already connected. Connect the normal safety ground and recheck if "utility" ground had not been connected.
Output Current Varies Without Voltage Change		
1. Abnormal current fluctuation, voltage nearly constant	a. Loose cable connections at output	Check for overheated connections and tighten.
GPU Will Not Turn Off		
1. Contactor fails to open	a. Contacts sticking in contactor	Clean contacts or replace contactor, whichever is needed.
No Voltage Output		
1. Unit on, but no output voltage	a. Protective circuit tripped	Determine and correct cause of trip. Then reset and restart unit.
	b. Component failure in protective circuit	Find the defective component and replace it.
	c. Control circuit board failure	Check control board per Section 2-2 and replace it if faulty.

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
Output Voltage Not Proper Level		
1. Poor voltage regulation	**a.** Loose connection of voltage sensing lead	Check connection at output contactor and control circuit board. Tighten connection as necessary.
2. Output voltage too high (above 32 Volts)	**a.** Voltage calibration off	Attempt calibration per Section 2-2. If calibration isn't possible replace PC control board.
	b. Voltage sensing lead open	Repair or replace voltage-sensing lead.
3. Unstable voltage	**a.** Open filter capacitor	Find and replace defective capacitor.
	b. One or more SCRs not firing properly	Adjust balance control or replace defective SCR heat sink assembly if oscilloscope shows faulty SCR devices. Replace PC control boards if oscilloscope shows no gate pulse and the PC control board inputs and controls are proper except for output.

Trouble, Symptom, Condition	Probable Cause	Test, Check, and/or Remedy
Output Contactor Fault		
1. Output contactor will not close.	**a.** Defective output switch (S2)	With the unit turned off, place a jumper between terminals 2 and 4 on S2. Turn S1 on. If output contactor closes, S2 is defective. Replace.
	b. Defective input contactor auxiliary contacts (K1)	With the unit turned off, place a jumper between terminals NO 1 and COM 3 on input contactor. Turn S1 on, and place S2 in Close position. If output contactor closes, K1 is defective. Replace.
	c. Defective output voltage select switch (S103) (if applicable)	With the unit turned off, place a jumper between terminals 4 and 5 on S103. Turn S1 on, and place S2 in Close position. If Output contactor closes, S103 is defective. Replace.
	d. Defective output contactor (K2).	Measure voltage between + and – terminals on K2 Coil with S1 on and S2 held in Close position. If 28.5 VDC is present K2 is defective.
2. Output contactor will not stay closed.	**a.** Defective output switch (S2)	With the unit turned off, place a jumper between terminals 1 and 3 on S2. Turn S1 on, and place S2 in Close position. If output contactor stays closed after S2 is released, S2 is defective. Replace.
	b. Defective output contactor auxiliary contacts (K2)	With the unit turned off, place a jumper between terminals NO 3 and NO 4 on output contactor. Turn S1 on, and place S2 in Close position. If output contactor stays closed after S2 is released, K2 is defective. Replace.

Section 2 Calibration and Test of PC Control Board

IMPORTANT

Before attempting to make tests and adjustments on the GPU, READ THIS ENTIRE SECTION to become familiar with the proper procedures.

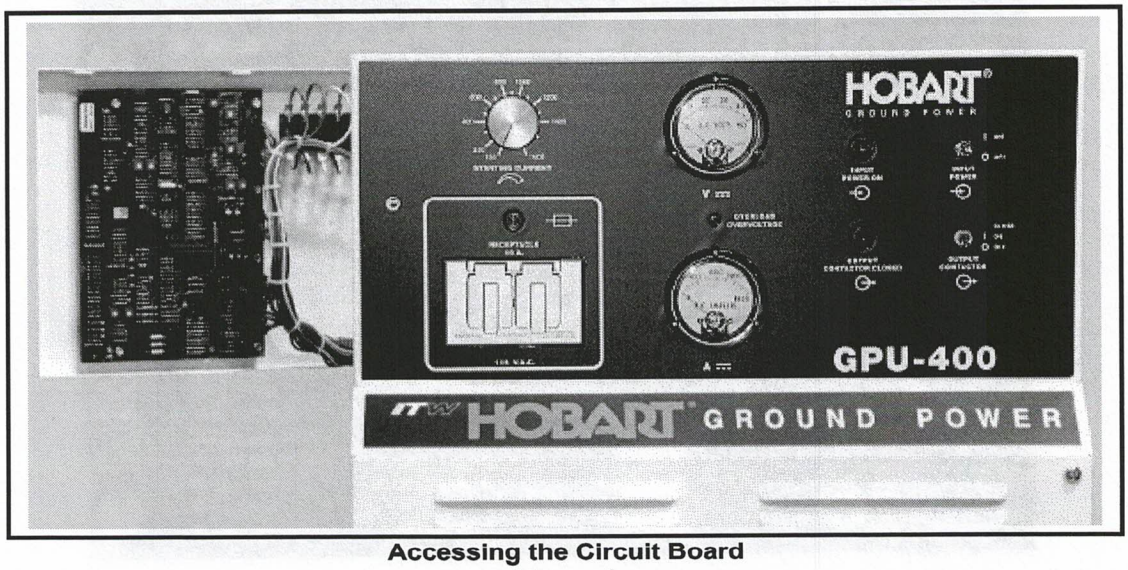
1) General

This section describes the test points, test values, and adjustment locations for testing and adjusting the printed circuit board that controls the GPU. The control board is mounted on a hinged panel. To access the board for measurements and adjustments, open the panel so that the board is accessible from the front of the GPU and you don't have to work next to hazardous voltages.

Use the Test Procedure (Part 3 of this section) to determine if the circuit board is operating properly. Hobart recommends calibration of the PC board at the factory, but the calibration procedure is included in this section (Part 4) in case field calibration is necessary. Faulty control boards should be returned to the manufacturer for repair.

WARNING

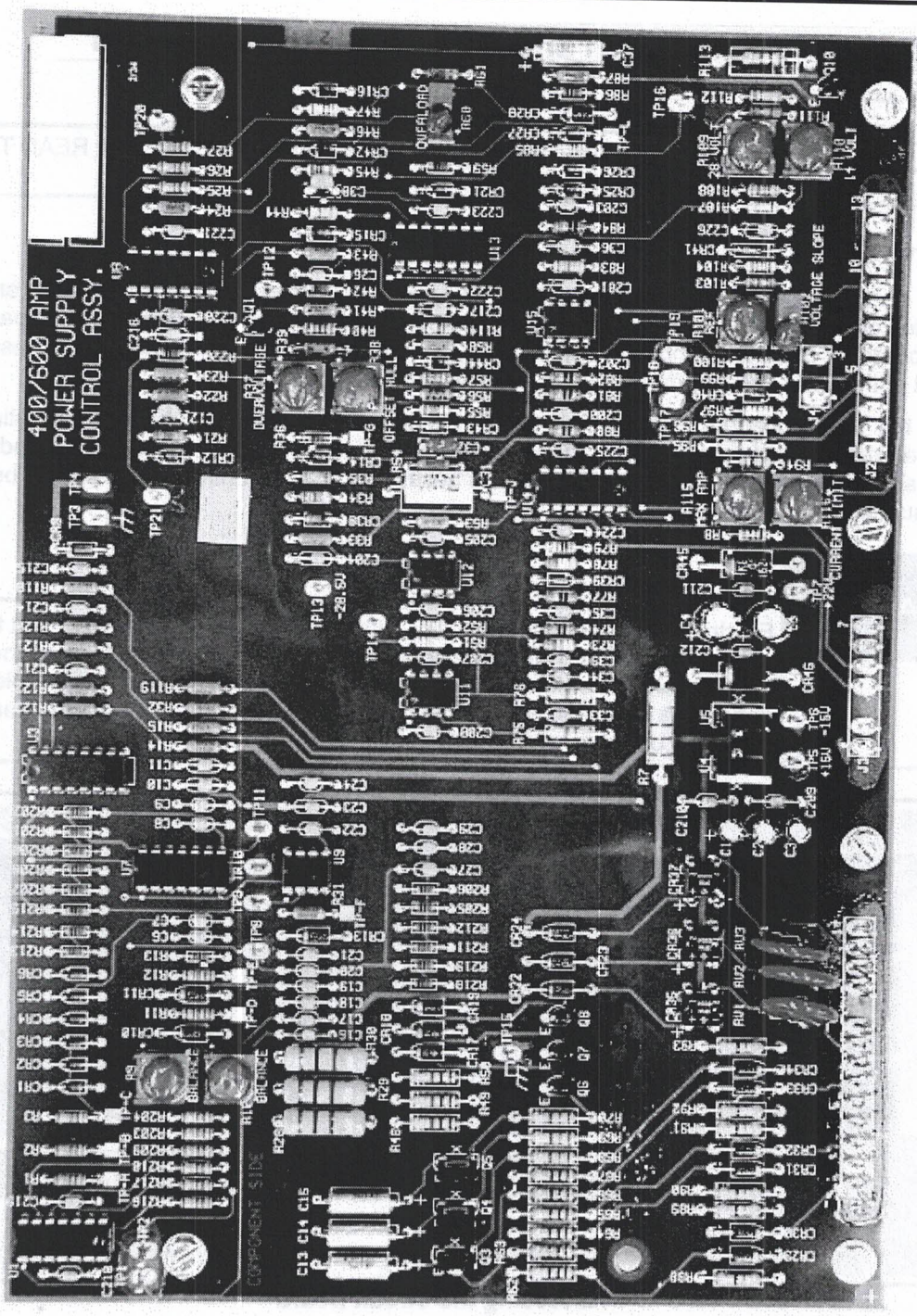
Electric shock and arcs can kill or injure! Use caution to inspect or test the printed circuit control board while the equipment is running. The voltages on the printed circuit board are safe; however, removing the top panel exposes people to dangerous voltages. When working with the circuit board, rotate the panel out to move the board away from internal parts.



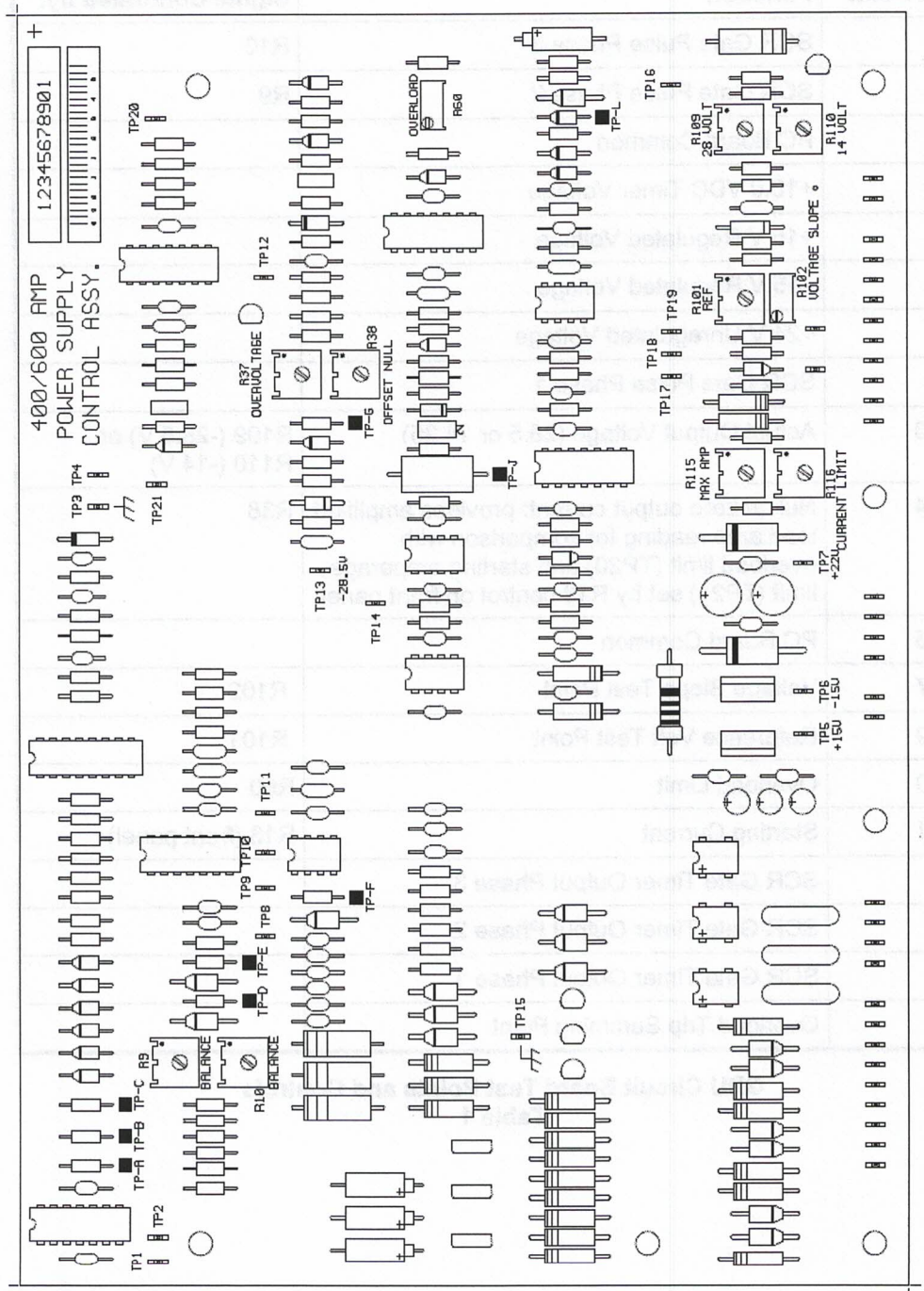
Accessing the Circuit Board
Figure 1

2) Circuit Board Components

This section is provided to help you locate test points and controls on the circuit board and understand their functions. Figures 2 and 3 show the locations of test points and adjustment potentiometers for possible field adjustment. Table 1 shows the functions of the test points and adjustments.



GPU Circuit Board Components
Figure 1



GPU Circuit Board Test Points and Controls
Figure 2

Test Point	Function	Signal Controlled by:
TP1	SCR Gate Pulse Phase 3	R10
TP2	SCR Gate Pulse Phase 2	R9
TP3	PC Board Common	
TP4	+10.0 VDC Timer Voltage	
TP5	+15 V Regulated Voltage	
TP6	–15 V Regulated Voltage	
TP7	+24 V Unregulated Voltage	
TP8	SCR Gate Pulse Phase 1	
TP13	Actual Output Voltage (28.5 or 14.25)	R109 (-28.5 V) or R110 (-14 V)
TP14	Null at zero output current: provides amplified load amp reading for comparison with overload limit (TP20) and starting amperage limit (TP21) set by R13 control on front panel.	R38
TP15	PC Board Common	
TP17	Voltage Slope Test Point	R102
TP19	Reference Volt Test Point	R101
TP20	Overload Limit	R60
TP21	Starting Current	R13 (front panel)
TPD	SCR Gate Timer Output Phase 3	
TPE	SCR Gate Timer Output Phase 2	
TPF	SCR Gate Timer Output Phase 1	
TPL	Overload Trip Summing Point	

GPU Circuit Board Test Points and Controls
Table 1

3) Test Procedure

Follow the table steps in this section to verify that the PC board is functioning properly. If the voltage readings to the PC board common are not within specification, attempt to correct the reading by adjusting the applicable control. Be certain the operating conditions are exactly as stated in the table.

If the board does not adjust, check the leads, fuses (F2-F7), and connectors. If no external problems are found, the PC control board is faulty. Replace it with a known good board.

After replacing the board, recheck the voltages. In some cases, minor adjustments may be required for optimum calibration. If the replacement board shows the same magnitude of error and lack of adjustment control, it is possible that the control board is not at fault. The voltages in the following table are all referenced to pc board common, which is Test Point 3 (TP3) and Test Point 15 (TP15). Connect the negative voltmeter lead to either of those test points.

TEST STEP	TEST POINT	TEST CONDITION	VOLTAGE MEASUREMENT	TEST DESCRIPTION
1	TP5	Open circuit: no load	+ 15 VDC ± 5%	Checks (+) voltage regulator output set by U4.
2	TP6	Open circuit: no load	- 15 VDC ± 5%	Checks (-) voltage regulator output set by U5.
3	TP7	Open circuit: no load	+ 24 VDC ± 10%	Checks unregulated control voltage needed for 1 and 2
4	TP4	Open circuit: no load	+ 10 VDC ± 10%	Checks gate pulse timer volts supply set by CR9
5	TPD	Open circuit: no load	+ 3.3 VDC + /-10%	Checks gate pulse timer operation before phase balancing and amplification
	TPE	Open circuit: no load	+ 3.3 VDC ± 10%	Checks gate pulse timer operation before phase balancing and amplification
	TPF	Open circuit: no load	+ 3.3 VDC ± 10%	Checks gate pulse timer operation before phase balancing and amplification
6	TP1	With a 100 A load, adjust R9 and R10 carefully for lowest ripple voltage (typically 100 to 160 mV).	-8.2 VDC ± 10% (measured with no load)	Checks gate pulse timer operation and balance adjustment
	TP2		-8.2 VDC ± 10% (measured with no load)	Checks gate pulse timer operation and balance adjustment
	TP8		-8.2 VDC ± 10% (measured with no load)	Checks gate pulse timer operation and balance adjustment.

TEST STEP	TEST POINT	TEST CONDITION	VOLTAGE MEASUREMENT	TEST DESCRIPTION
7	TP14	Open circuit: no load	0 VDC ± .01V	Checks for null (0) by R38 for the no load current signal
8	TP17	---	+ 1.25 ± 10%	Checks voltage slope calibrated with R102
9	TP19	---	- 5 VDC ± 1%	Checks reference voltage adjusted by R101
10	TP13	---	- 28.5 VDC ± 1%	Checks output volts set by R109 in 28 VDC mode
	TP13	---	- 14.3 VDC ± 1%	Checks output volts set by R110 in 14 VDC mode
11	TP20	---	6 ± .5 VDC	Checks R60 overload current setting
12	TPL	Standard load	Near zero (0.002 V)	Optional test
	TPL	Overload	12 to13 VDC	Checks overload light, DS2, and circuit functioning (Q10)

GPU Circuit Board Tests
Table 2

4) Circuit Board Calibration

Equipment Requirements

Calibration requires the following equipment:

- a load bank – able to pull 2000 amps at 28.5 volts
- two voltmeters - ± 2% accuracy
- an oscilloscope
- a 3.3 kΩ resistor
- small test clips

Also, if your GPU is set up for bridge interlock and remote connection option, you will need to add switches:

- Connect normally open "Start" switch between TB101-1 and TB101-2.
- Connect normally closed "Stop" switch between TB101-2 and TB101-3.

Calibration Procedure

(1) Connect the output cable to the load bank.

(2) Connect a voltmeter to the output.

(3) Turn the power switch on. The amber "Power On" light should be on.

(4) Set the SCR gate balance

a) Connect the oscilloscope probe to the heat sink and the oscilloscope ground to the braid of the heat sink fly-back diode (CR 7).

b) Verify output pulses for the six SCRs.

c) Balance the levels with R9 and R10.

(5) Close the output contactor. Make sure the green "Contactor Closed" light turns on.

(6) Turn the GPU off.

(7) Adjust the offset null

a) Connect another voltmeter to TP14 (positive) and TP15 (negative).

b) Turn on the GPU and close the output contactor.

c) The test point voltage should be 0.000 ± 0.005 VDC.

d) Adjust R38 (offset null adjust) for the proper reading.

(8) Adjust the voltage reference

a) Move the positive voltmeter lead to TP19.

b) The voltage should be -5.00 ± 0.010 VDC.

c) Adjust R101 (reference adjust) for the proper reading.

(9) Check the over-voltage adjustment

When an over-voltage occurs, the output contactor should open and the red "Overload" light should turn on.

a) Turn the "Starting current" knob to the maximum setting.

b) Turn R109 (28 volt adjust) all the way counterclockwise. The output voltage will drop to around 22 volts.

c) Jumper a 3.3 kΩ resistor across R111 (next to R109). The output voltage will increase to about 30 volts.

d) Use R109 to raise the output voltage until the over-voltage fault trips. The output voltage must be between 31.0 and 31.8 VDC at the trip point.

e) Adjust R37 (over voltage adjust – control very touchy) for proper trip point.

f) Remove the 3.3 kΩ jumper resistor and reset output voltage for 28.50 to 28.60 VDC.

(10) Check the voltage slope adjustment

a) Apply a 400 amp load.

b) Connect the voltmeter positive to TP17 and negative to TP14.

c) The test point voltage should be 0.000 to 0.020 VDC.

d) Adjust R102 (voltage slope adjust) for proper reading.

(11) Check the current limit adjustment

a) Turn the starting current knob to the 1600 amp setting.

b) Apply a 1600 amp load and check to make sure the unit is not current limiting.

c) The output voltage should be 19.5 to 22.5 VDC.

d) Adjust R115 (max amp. adjust) for proper output voltage.

(12) Check overload trip point

When an overload occurs, the output contactor should open and the red "Overload" light should turn on.

a) Increase the load at the load bank to make sure the overload turns on between 1750 and 1825 amps.

b) Adjust R60 (overload adjust) to adjust the current overload trip point.

(13) Check the starting current adjustment

a) Set starting current knob to 400 and apply a 600 amp load.

b) The output current should be 400 amp ± 25 amps.

c) If not, adjust R116 (current limit knob adjust) until output current equals 400 amps.

d) Remove the load.

(14) Test operation at 14 Volts (only if that option is installed)

a) Set the voltage switch to 14 V.

b) Set the "Starting Current" knob to 1600 amps.

c) At no load, the output voltage should be 14.20 to 14.30 VDC.

d) Adjust R110 (14 volt adjust) for proper setting.

e) Check balance and firing of all six SCR's.

Section 3 Scheduled Maintenance

1) General

The Hobart GPU is designed to be as maintenance free as possible. Therefore, there are few maintenance requirements. Field maintenance of the GPU should be performed only by qualified service personnel, and should be limited to cleaning and inspection of the unit and its components, as well as, the replacement of lamps and fuses. All service and repair work, including testing and calibration, should be referred to the Hobart Ground Power Service Department, to an authorized service shop for Hobart Ground Power equipment, or to qualified electronic technicians.

2) Maintenance Schedule

	As required	Daily 8 hrs.	1 month 200 hrs.	3 months 600 hrs.	6 months 1200 hrs.
*** EXTERIOR CABLES**					
Inspect equipment		X			
Inspect AC input cables		X			
Check cable connections (internal)					X
*** CONTROLS AND INSTRUMENTS**					
Check voltmeter functioning	X				
Check ammeter functioning	X				
Check fan thermostat operation		X			
Check indicating lights		X			
Check starting current limit functioning			X		
Check all output contactor contacts					X
Check power input contactor contacts					X
Check voltmeter & ammeter accuracy					X
Check all wiring and connections					X
Inspect and clean general (light duty)					X
Inspect and clean general (severe duty)				X	
*** FAN MOTOR**					
See Lubrication section below					

*Suspicious performance overrides timetable

Inspection Schedule
Figure 1

3) Inspection During Operation

a) Make sure the meters are functioning. If a meter is suspected of being inaccurate, check it against a test instrument.

b) Verify the lights for Input Power On and Output Contactor closed are functional. Replace if necessary. The Overload/Over Voltage light is an LED, so it will probably not fail.

c) Verify that the fan turns on after the unit has been operating for a while. If the fan turns on immediately on a cold unit, that might indicate a shorted fan thermostat switch.

d) Check the Starting Current potentiometer. If this control has no effect on currents above its minimum setting, that might indicate a faulty potentiometer or faulty circuit board.

4) Preparation for Internal Inspection

a) Turn off input power at the source. Make sure that power cannot be inadvertently turned back on.

WARNING

High voltage may be present inside the GPU cabinet, even when the unit is off. Exercise extreme caution or **FATAL SHOCK** may result.

WARNING

HIGH VOLTAGE - electric shock can kill! Be certain the input power source is turned off before opening the cabinet. Stop operation immediately if a possible dangerous fault is discovered. The front panel input contactor switch does not remove input power from all components. Be sure capacitors are discharged before you touch.

b) Observe the front panel voltmeter and make sure the voltage is zero. If the voltage is not zero, the capacitors still hold a charge, indicating a problem with the connection to the preload resistors.

c) Observe general condition of power-input cables and equipment output cables. Inspect for cuts and abrasions in the insulation that could cause a short circuit. Visually inspect the output cable plug connector for physical damage and evidence of overheating.

d) Remove the top cover.

5) Internal Inspection

a) Using compressed air or a soft brush, clean any dirt and debris from the interior.

b) Inspect terminal blocks for evidence of overheating due to loose electrical connections.

c) Inspect electrical and mechanical connections for tightness.

d) Remove the front panel screw that holds the circuit board panel. Swing the circuit board panel out to the side.

e) Inspect the circuit board for evidence of overheating, such as burned components.

f) Inspect the hinge for the circuit board panel. If this hinge sticks or is difficult to operate, spray the hinge with a silicone spray lubricant.

g) Inspect all wiring, leads, and cables. Inspect for cuts, abrasions, and signs of deterioration and overheating. Inspect the leads for broken strands and terminals.

h) Inspect the output contactor. If the contacts are badly burned, the contactor should be replaced as soon as possible. Slightly pitted and burned contacts can be cleaned up with a commercial contact cleaner and very fine-grained emery cloth or equivalent.

i) Turn the fan blade by hand to make sure that it turns freely.

j) If required, lubricate the fan (refer to the next section for the lubrication schedule).

k) When finished with inspections:

- Return the circuit board panel to its closed position and secure with the screw.
- Replace the top cover.
- Turn on power at the source and check for normal operation.

6) Lubrication

No lubrication is required, except for the fan motor. The fan motor incorporates a sleeve bearing, and therefore requires periodic lubrication.

a) Lubrication Schedule

The following table shows the fan motor manufacturer's recommendations for lubricating the motor.

Type of Duty	Usage – Starts Per Hour	Usage – Hours Per Day	Lubrication Interval (years)
Light	0 – 4 starts	0 – 8 hours	Every 4 years
Moderate	5 - 10 starts	9 – 16 hours	Every 3 years
Heavy	Over 10 starts	17 - 24 hours	Every 2 years

Fan Motor Lubrication Schedule
Figure 2

Lubricate more frequently in dirty environments (3, 2, or 1 years instead of 4, 3, or 2).

b) Oil Type

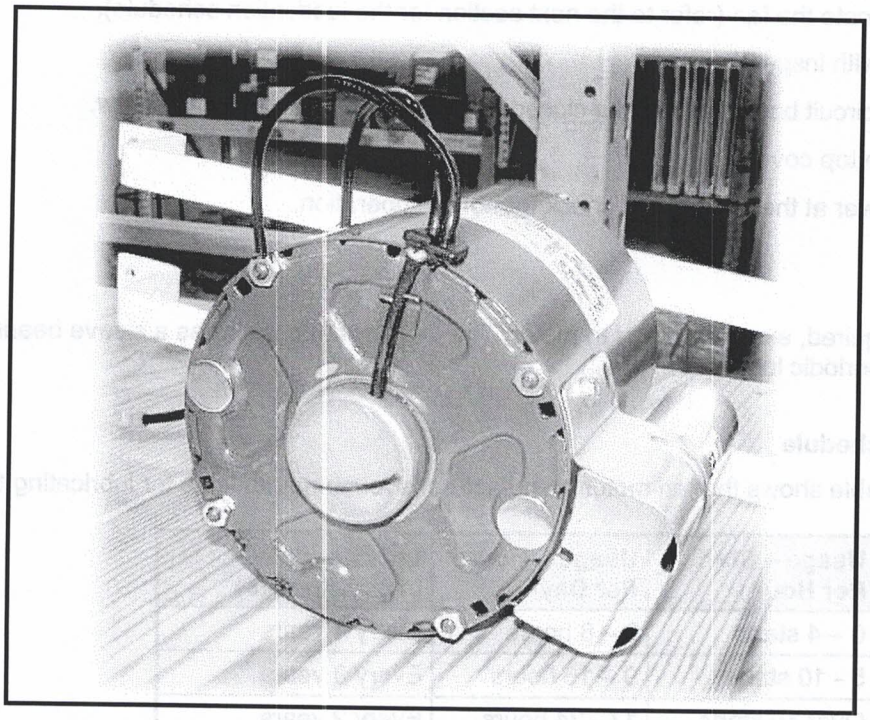
Use SAE-20 or 10W30 electric motor or automotive oil. Do not use definite purpose oils such as those for sewing machines, cleaning, rust preventative, or cutting applications.

c) Quantity

Use 10 – 15 drops per end (approximately 1.0 cc or 1/8 teaspoon). Do not over oil.

d) Oil Locations

The figure below shows a tube extending upward from the rear bearing. The front bearing has a similar tube. Use these tubes to oil the bearings.



Fan Motor Oil Locations
Figure 3

7) Inspection Records

Since the fan lubrication is so infrequently, you should keep track of the lubrications using the chart below or some similar record.

Inspection Date	Fan Motor Oiled? (circle Y or N)	Inspection Notes
	Y N	
	Y N	
	Y N	
	Y N	
	Y N	
	Y N	
	Y N	
	Y N	
	Y N	
	Y N	

Chapter 3 Overhaul / Major Repair / Inspection

Unscheduled Repair

1) General

Repair of the GPU will consist primarily of parts replacement. Most of the components used in the GPU cannot be disassembled and repaired, and must be replaced if faulty. Additionally, inoperative PC boards cannot be repaired in the field, but must be replaced as a complete unit. PC boards may be returned to the factory for replacement. Contact Hobart Ground Power for parts and replacement instructions.

2) Service Information and Factory Repair

The Hobart Ground Power Service Department can answer questions concerning the operation, repair, or servicing of this GPU. When making such an inquiry, be sure to provide the model number, serial number, and approximate date of receipt of the unit. If it is deemed necessary to return the unit to the factory for servicing, contact the Service Department for authorization. It is rarely necessary to return a failed GPU since the unit uses plug-in type assemblies throughout its systems. For warranty information, refer to the warranty statement at the front of this manual or contact the Hobart Service Department.

When ordering parts from your Hobart Ground Power Distributor, be sure to include all pertinent information from the unit's identification plate: Specification No., Model No., and unit rating.

Write:	Hobart Ground Power Service Department 1177 Trade Road East Troy, Ohio 45373 U.S.A.
Call Inside U.S.A.:	(800) 422-4166 (Parts) (800) 422-4177 (Service)
Call From Foreign Countries:	(937) 332-5050 (Parts) (937) 332-5060 (Service)
FAX Inside U.S.A.	(800) 367-4945
FAX From Foreign Countries:	(937) 332-5121
E-Mail:	service@itwgsegroup.com
Web Page:	www.itwgsegroup.com

3) GPU Removal and Replacement

If extensive repairs are to be made on the GPU, you may wish to move it to a more convenient location.

WARNING

High voltages may be present inside the cabinet, even when the unit is off. Exercise extreme caution or **FATAL SHOCK** may result.

a) Turn off the input power at the source. Make sure that the power cannot be inadvertently turned back on.

b) Remove the top cover.

c) Disconnect the three AC input leads at the terminals on the input contactor and the grounding wire at the grounding lug.

d) Loosen the cable clamp on the rear of the GPU and remove the input cable from the clamp.

e) Disconnect the output cable from the output contactor (+) and the ammeter shunt (-).

f) Loosen the cable clamp at the base and remove the output cable from the GPU.

g) If the unit is a bridge mount unit, also disconnect and remove the remote control cables.

h) If the unit is bridge mount or fixed mount, attach a lifting hoist or forklift to the bottom of the GPU and remove the mounting screws or bolts that attach the GPU to its mounting.

i) Carefully remove the GPU.

j) Move the GPU to a clear working area where it can be placed on a solid supporting structure.

k) Re-install the GPU in the reverse order of removal. See Section 1-2 for additional information on installing the GPU.

4) Component Removal and Replacement

Most of the components in the GPU are easily replaced when necessary. Chapter 1 and Chapter 4 show the locations of the components in the GPU.

WARNING

To avoid the danger of electric shock, always make sure that the input power is turned off at the source and cannot be inadvertently turned back on before working inside the GPU.

a) Lights

The light bulbs are accessible from the front by unscrewing the lens.

Light	Unit	Bulb Type
Input Power On	Standard	Type 120 MB (120 V, .025 A, T-2-1/2)
	Units with CE marking	Type 757 (28 V, .08 A)
Output Contactor Closed	All	Type 757 (28 V, .08 A)
Overload/Overvoltage	No bulb – this is an LED assembly	

b) Circuit Board

Chapter 4-3, Figure 2 gives the location and part number of the circuit board. To replace the circuit board, unplug the connectors and remove the six screws.

c) Fuses

The following table provides the locations and functions of the fuses. If a fuse has blown, check the related circuitry. Always replace the fuses with similar fuses having the same type and rating.

Fuse	Protects	Location	Rating
F1	Fan	Fan shroud	5 A, 250 V, Type ABC
F2 – F7	Circuit Board	Fuse block next to circuit board	1 A, 250 V, Type AGC, Fast blow
F8	Input Contactor	Control transformer	0.5 A, 250 V, Type AGC, Fast blow
F9	Receptacle	Front Panel	10 A, 250 V, Type ABC

d) Thermostat Switches

Two thermostat switches mount to the top of the heat sink assembly. Refer to Chapter 4-3, Figure 7. The switch on the left side controls the fan. The switch on the right side shuts down the GPU when an overload occurs.

The fan thermostat is normally open. If this switch fails in the open position, the fan will never turn on and the unit will eventually shut off with an overload indication. If the fan thermostat fails in the closed position, the fan will run continuously, even when the unit is cold. This switch turns on when the temperature reaches 100° ± 8° F and turns off when the temperature falls back down to 80° ± 5° F.

The overload thermostat is normally closed. If this switch fails in the open position, the GPU will not produce any output voltage. If this switch fails in the closed position, the GPU will not shut down if the heat sink gets too hot. This switch opens when the temperature reaches 190° ± 5° F and closes when the temperature falls back down to 172° ± 8° F.

Both of these switches can be tested using an ohmmeter and a heat gun. To replace a thermostat, unplug the wires and then remove the two screws that hold it. Reconnect the wires to the new thermostat.

e) Fly-back Diode

The fly-back diode, CR7, is located on the left side of the heat sink assembly near the base. Failure is not common, but if fails in a shorted condition, it can cause high input current. Refer to Chapter 2-1 for troubleshooting information.

Chapter 4-3, Figure 7 gives the part number for the diode.

(1) Buff the heat sink in the area where the diode attaches to remove any oxidation.

(2) Smear a thin film of Burndy Penetrox "A" (or similar oxide-inhibiting electrical joint compound) in the area where the diode attaches to the heat sink.

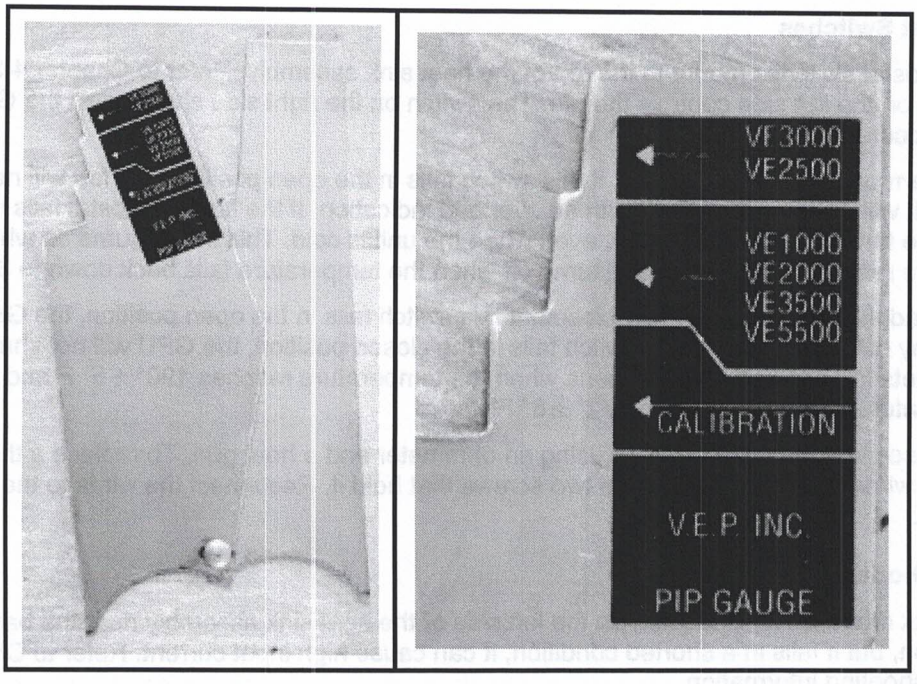
(3) When replacing the diode, torque the nut to 4.2 to 5.2 ft-lb. (5.7 to 7.05 N-m).

f) SCR Diodes

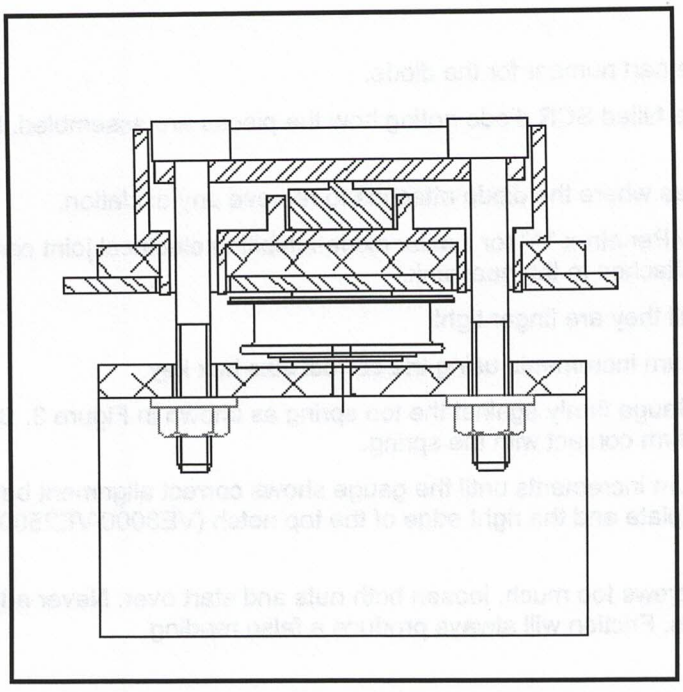
The six SCR diodes mount to the heat sink. If an SCR fails to conduct, it can cause excessive ripple in the output. If an SCR fails by shorting, the unit can draw excessive input current. SCR replacement is somewhat complicated, so be sure that a failed SCR is the cause of the problem before replacing. Refer to Chapter 2-1 for troubleshooting information.

If you plan to replace an SCR, you will need a 903878 Force Indicator Gauge. This gauge, shown in Figure 1, measures the deflection of the flat spring on top of the SCR as the screws are tightened. The gauge consists of two metal plates that are free to rotate about a common point where they are fastened together.

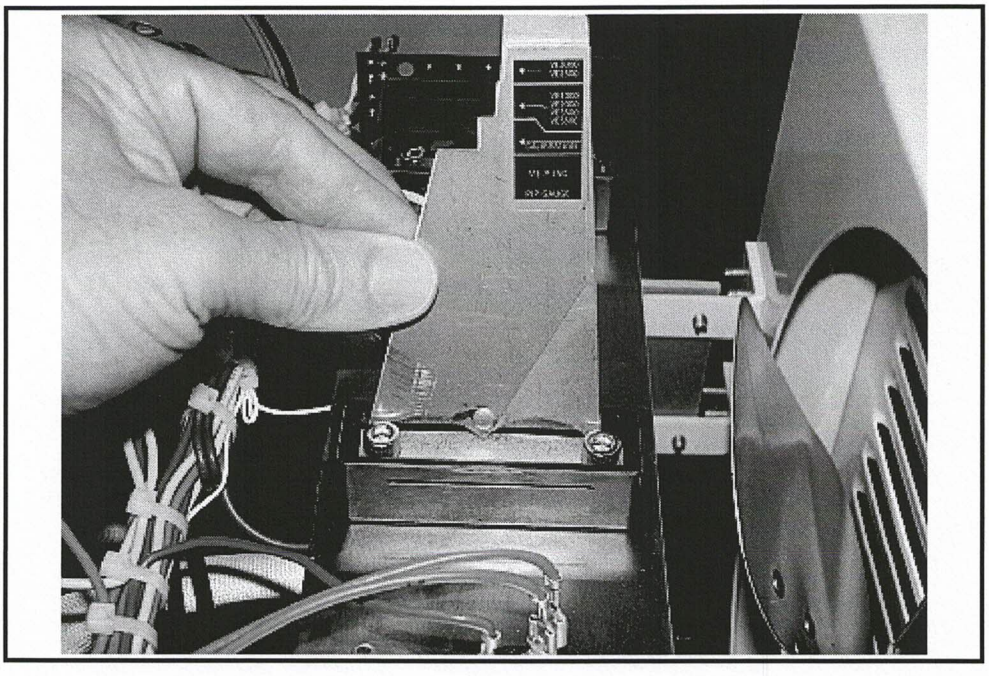
- When this gauge is placed on a flat surface so that it makes three-point contact, the sheet metal plates rotate so that the left edge of the rear plate aligns with the right edge of the front piece at the calibration notch.
- When this gauge is placed on a properly-adjusted SCR spring, the left edge of the rear plate aligns with the right edge of the front plate at the top notch (marked VE3000/VE2500).



Force Indicator Gauge
Figure 1



SCR Mounting Components
Figure 2



Measuring the Spring Deflection
Figure 3

Chapter 4-3, Figure 7 gives the part number for the diode.

(1) Disconnect and remove the failed SCR diode noting how the pieces are assembled. Figure 2 shows a cross section.

(2) Buff the heat sink in the area where the diode attaches to remove any oxidation.

(3) Smear a thin film of Burndy Penetrox "A" (or similar oxide-inhibiting electrical joint compound) in the area where the diode attaches to the heat sink.

(4) Tighten the nuts evenly until they are finger tight.

(5) Tighten each screw in 1/4 turn increments using the correct size hex key.

(6) Place the Force Indicator Gauge firmly against the top spring as shown in Figure 3. Be sure both ends and the center are in firm contact with the spring.

(7) Tighten the screws in 1/4 turn increments until the gauge shows correct alignment between the left edge of the rear gauge plate and the right edge of the top notch (VE3000/VE2500) on the front gauge plate.

(8) If you have tightened the screws too much, loosen both nuts and start over. Never adjust the force by backing off the nuts. Friction will always produce a false reading.

Chapter 4 Illustrated Parts List

Section 1 Introduction

1) General

The Illustrated Parts List identifies, describes, and illustrates main assemblies, subassemblies, and detail parts of your ground power unit manufactured by Hobart Ground Power, Troy, Ohio.

2) Purpose

The purpose of this list is to provide parts identification and descriptive information to maintenance and provisioning personnel for use in provisioning, requisitioning, purchasing, storing, and issuing of spare parts.

3) Arrangement

Chapter 4 is arranged as follows:

Section 1 - Introduction
Section 2 - Manufacturer's Codes
Section 3 - Illustrated Parts List
Section 4 - Numerical index

4) Explanation of Parts List

a) Contents

The parts list contains a breakdown of the equipment into assemblies, subassemblies, and detail parts. All parts of the equipment are listed except:

(1) Standard hardware items (attaching parts) such as nuts, screws, washers, etc., which are available commercially.

(2) Bulk items such as wire, cable, sleeving, tubing, etc., which are also commercially available.

(3) Permanently attached parts, which lose their identity by being welded, soldered, riveted, etc., to other parts, weldments, or assemblies.

b) Parts List Form

This form is divided into six columns. Beginning at the left side of the form and proceeding to the right, columns are identified as follows:

(1) FIGURE-ITEM NO. Column

This column lists the figure number of the illustration applicable to a particular parts list and also identifies each part in the list by an item number. These item numbers also appear on the illustration. Each item number on an illustration is connected to the part to which it pertains by a leader line. Thus the figure and item numbering system ties the parts lists to the illustrations and vice versa. The figure and index numbers are also used in the numerical index to assist the user in finding the illustration of a part when the part number is known.

(2) HOBART PART NUMBER Column

All part numbers appearing in this column are Hobart numbers. In all instances where the part is a purchased item, the vendor's identifying five-digit code and his part number will appear in the "NOMENCLATURE" column. Vendor parts, which are modified by Hobart, will be identified as such in the "NOMENCLATURE" column. In case Hobart does not have an identifying part number for a purchased part, the "HOBART PART NUMBER" column will reflect "No Number" and the vendor's number will be shown in the "NOMENCLATURE" column. Parts manufactured by Hobart will reflect no vendor or part number in the "NOMENCLATURE" column.

(3) NOMENCLATURE Column

The item identifying name appears in this column. The indenture method is used to indicate item relationship. Thus, components of an assembly are listed directly below the assembly and indented one space. Vendor codes and part numbers for purchased parts are also listed in this column when applicable. Hobart modification to vendor items is also noted in this column.

(4) EFF (Effective) Column

This column is used to indicate the applicability of parts to different models of equipment. When more than one model of equipment is covered by a parts list, there are some parts that are used on only one model. This column is used for insertion of a code letter A, B, etc., to indicate these parts and to identify the particular model they are used on. Since this manual covers only one generator set specification, this column is not used in this manual.

EFF Code	Part & Dash Number	Mounting	CE Certified	Input Voltage	Input Frequency	Output Voltage	Output Current
A	500160-401	Trailer	--	208/230/460	60 Hz.	28.5 VDC	400 A
B	500160-402	Trailer	--	220/380	50 Hz.	28.5 VDC	400 A
C	500160-403	Trailer	--	230/460/575	60 Hz.	28.5 VDC	400 A
D	500160-411	Trailer	Y	208/230/460	60 Hz.	28.5 VDC	400 A
E	500160-412	Trailer	Y	220/380	50 Hz.	28.5 VDC	400 A
F	500160-421	Stationary	--	220/230/460	60 Hz.	28.5 VDC	400 A
G	500160-422	Stationary	--	220/380	50 Hz.	28.5 VDC	400 A
H	500160-451	Bridge	--	220/230/460	60 Hz.	28.5 VDC	400 A
J	500160-452	Bridge	--	220/380	50 Hz.	28.5 VDC	400 A

(5) UNITS PER ASSEMBLY Column
This column indicates the quantity of parts required for an assembly or subassembly in which the part appears. This column does not necessarily reflect the total used in the complete end item.

Section 2 Manufacturer's Codes

1) Explanation of Manufacturer's (Vendor) Code List

The following list is a compilation of vendor codes with names and addresses for suppliers of purchased parts listed in this publication. The codes are in accordance with the Federal Supply Codes for Manufacturer's Cataloging Handbook H4-1, (CAGE CODES) and are arranged in numerical order. Vendor codes are inserted in the nomenclature column of the parts list directly following the item name and description. If a manufacturer does not have a code, the manufacturer's full name is listed in the nomenclature column.

Code	Vendor's Name and Address
D0024	SEMIKRON ELEKTRONIK GMBH Sigmundstrasse 200 P.O. Box 82 02 51 Nuernberg, Germany 90431
E0615	Kraus and Naimer 42 Miramar Avenue P.O. Box 15-009 Wellington, New Zealand
S7023	Bossard LTD Fasteners Steinhauserstrasse 70 Zug, Switzerland, CH-6300
0CYC7	Western Rubber & Supply 7888 Marathon Dr Ste Livermore, CA 94550 - 9314
0E8J0	Emka Inc. 1961 Fulling Mill Rd. Middletown, PA 17057-3125
0HZP9	Diesel Radiator Co. 1985 Janice Ave. Melrose Park, IL 60160-1008
0MR72	Henkel Corp 26941 Cablot Rd, Suite 124 Laguna Hills, CA 92653-7007
0TSE6	Infineon Technologies Industrial Power Inc. 1050 US HWY 22 Lebanon, NJ 08833-4208
00779	Tyco Electronics (Amp) 2800 Fulling Mill Rd Bldg-38 Middletown, PA 17057 - 3142

Code	Vendor's Name and Address
01XD4	Contact Industries Inc 25 Lex-Industrial Dr Mansfield OH 44903 - 8699
01428	Tuthill Corporation DBA Tuthill Controls Group 2110 Summit St. New Haven, IN 46774-9524
02660	Amphenol Corp. Spectra-Strip/ltd 40-60 Delaware Ave SIDNEY, NY 13838 - 1395
02768	Illinois Tool Works Inc. Fastex Division 195 S. Algonguin Rd. Des Plaines, IL 60016-6197
02929	Newark Electronics Div 4801 N Ravenswood Ave Chicago, IL 60640 - 4457
05HB5	Magnecomp Inc. 161 Eagles Nest Dr Pickens, SC 29671-7808
05YB3	Acon Inc. 22 Bristol Dr. South Easton, MA 02375-1108
1AA44	Collmer Semiconductor Inc. 2542 Highlander Way Carrollton, TX 75006
1DG36	Phillips And Temro Industries Inc E. M. Products Inc. 5380 Cottonwood Ln Prior Lake, MN 55372

Code	Vendor's Name and Address
1DL99	Fleetguard Inc. Div. of Cummins Engine Company 311 N. Park Street Lake Mills, IA 50450 - 1299
1E045	Austin Hardware and Supply Co. 950 Northwest Technology Dr Lees Summit, MO 64086 - 5692
1SPJ9	Hobart Ground Power 1177 Trade Road East Troy, OH 45373
1W134	Eaton Corp. 4201 N. 27TH St Milwaukee, WI 53216-1897
12662	Peterson Mfg Co. 4200 E 135th St Grandview MO 64030-2896
13445	Cole-Herse 20 Old Colony Ave. Boston, MA 02127-2405
14552	Microsemi Corporation 2381 Morse Ave Irvine, CA 92614-6233
14799	Square D Company, Inc Dba Schneider Electric USA, Inc. 9522 Winona Ave Schiller Park, IL 60176-1084
16476	Maxima Technologies & Systems Llc 1811 Rohrerstown Rd Lancaster, PA 17601-2321
18265	Donaldson Company Inc. DBA Torit Products 1400 W. 94th St. Minneapolis, MN 55431-2370
2B428	MJO Industries Inc. DBA Hughes-Peters 8000 Technology Blvd. Huber Heights, OH 45424 - 1573
2B664	All-Phase Electric Supply Co 1620 W Main St P.O. Box 149 Springfield OH 45501-0149

Code	Vendor's Name and Address
2N562	Power Transmission Sales Inc. 531 Washington P.O. Box 229 Chagrin Falls, OH 44022-0229
23803	N T N Bearing Corp of America 191 Sheree Blvd Ste 101 Exton PA 19341-1265
24161	Gates Corporation 900 S Broadway Denver CO 80217-5887
24446	General Electric Co. 3135 Easton Tpke. Fairfield, CT 06431
25710	Deka Plastics Inc. 914 Westfield Ave. Elizabeth, NJ 07208-1222
27410	Harris Corp. 1025 W NASA Blvd. Melbourne, FL 32901
28520	Heyco Inc. 1800 Industrial Way N. Toms River, NJ 08755-4809
3A054	McMaster Carr Supply Co. 9630 Norwalk Blvd. Santa Fe Springs, CA 90670-2932
3Y208	Taylor And Summerville Battery Co 3485 Successful Way Dayton Oh 45414-4319
30104	Automotive Controls Corp. 1300 W. Oak St. P.O. Box 788 Independence, KS 67301-0788
30430	Marathon Electric Mfg. Corp. 398 Beach Rd. Burlingame, CA 94010-2004
311K7	Kissling Electrotec Incorporated 320 Business Pkwy, Ste A Greer, SC 29651
38151	Marathon Electric Mfg. Co. 100 E. Randolph St. Wausau, WI 54401-2568

Code	Vendor's Name and Address
39TH9	Motion Industries Inc. 8580 Industry Park Dr. Piqua, OH 45356-8535
40121	Peterson Mfg. Co. Inc. 700 W. 143rd St. Plainfield, IL 60544-9733
44655	Heico Ohmite LLC 1600 GOLF RD 850 ROLLING MEADOWS, IL 60008-4204
46922	Crawford Electric Co 445 E 32 Mile Rd Romeo MI 48065-5270
49234	Protectoseal Company 225 W Foster Ave Bensenville, IL 60106-1631
5N8K3	Alpha Devices 11963 Abbey Rd. Cleveland, OH 44133
5P059	Tech Products Corp. 2215 Lyons Rd Miamisburg, OH 45342-4465
50508	Magnetic Components Inc. 9520 Ainslie St. Schiller Park, IL 60176-1191
52793	Saginaw Products Corp. DBA CIGNYS 68 Williamson St. Saginaw, MI 48601-3246
54646	Clampco Products Inc. 1743 Wall Road Wadsworth, OH 44281-9558
55752	Parker Hannifin Corp. DBA Racor Div. 3400 Finch Rd. Modesto, CA 95354-4125
56289	Sprague Electric Company 678 Main St Sanford, MA, 04073-7003
57330	Remke Industries Inc. 310 Chadick Drive Wheeling, IL 60090-6039

Code	Vendor's Name and Address
57347	Wall Industries Inc. 5 Watson Brook Rd. Exeter, NH 03833-4589
57733	Stewart-Warner Corporation 333 Ludlow St Stamford, CT 06902-6987
59656	Dean Technology Inc. DBA CKE 1000 Lucerne Road Lucernemines, PA 15754-0211
6S553	Wes-Garde Components Group Inc 300 Enterprise Dr Westerville, OH 43081-8840
6Y440	Micron Technologies Inc. 8000 S. Federal Way Boise, ID 83716-7128
60038	Timken Corporation 1835 Dueber Ave Sw Canton, OH 44706-2728
61706	EAO Switch Corporation 98 Washington St. Milford, CT 06460-3133
62292	EBM Industries Inc. 110 Hyde Rd. P.O. Box 4009 Farmington, CT 06034-4009
62445	Deutz Corporation 3883 Steve Reynolds Blvd Norcross Ga 30093
66180	Automatic Timing and Controls 3312 Bloomingdale Melrose Park, IL 60160-1030
66844	Powerex Inc. 173 PAVILION LN Youngwood, PA 15697-1800
7M613	Wright F.B. Co. of Cincinnati 4689 Ashley Dr. Hamilton, OH 45011-9706
71382	Seal Master Bearings Sub Of Emerson Electric Co. 1901 Bilter Rd. Aurora, IL 60502-9704

Code	Vendor's Name and Address
71400	Cooper Bussmann Inc. 114 Old State Road Ellisville, MO 63021-5942
72619	Dialight Corporation 1501 State Rte 34 S Farmingdale, NJ 07727-3932
74400	Hobbs Corporation 1034 East Ash Street PO Box 19424 Springfield, IL 62794-9424
74542	Hoyt Electrical Instruments 23 Meter ST. Concord, NH 03303-1894
74545	Hubbell Inc Wiring Device Div 185 Plains Road Milford, CT 06460
74829	Ilsco Corp. 4730 Madison Rd. Cincinnati, OH 45227-1426
75418	Kysor Industrial Corporation 1 Madison Ave Cadillac, Michigan 49601-9784
75915	Littelfuse, Inc. 8755 W Higgins Road Ste 500 Chicago, IL 60631 - 2701
77342	TYCO Electronics Corporation 8010 Piedmont Triad Pkwy Greensboro, NC 27409
78388	Woodward Controls Inc. 6250 W Howard St Niles, Il 60714-3433
8A334	Cummins Bridgeway LLC 2297 SW Blvd Ste K Grove City, OH 43123-1822
8T246	Whitesell RO & Associates, Inc. 7009 CORPORATE WAY Dayton, OH 45459-4238
81483	International Rectifier Corp 233 Kansas St. El Segundo, CA 90245
81703	Mulberry Metal Products Inc. 2199 Stanley Terrace Union , NJ 07083-4399
82866	Research Products Corp. P.O. Box 1467 1015 E. Washington Ave. Madison, WI 53701
86797	Rogan Corp 3455 Woodhead Dr. Northbrook, IL 60062-1812
9Y826	Marsh Electronics Inc. 1563 S. 101st St. Milwaukee, WI 53214-4032
91637	Vishay Dale Electronics Inc. 1122 23RD St. Columbus, NE 68601-3647
91929	Honeywell International Inc. DBA Honeywell 11 W. Spring St. Freeport, IL 61032-4316
94222	Southco Inc. 210 N. Brinton Lake Rd. Concordville, PA 19331
97520	Basler Electric Company Route 143 Highland, IL 62249-1074

Section 3 Illustrated Parts List

1) Explanation of Parts List Arrangement

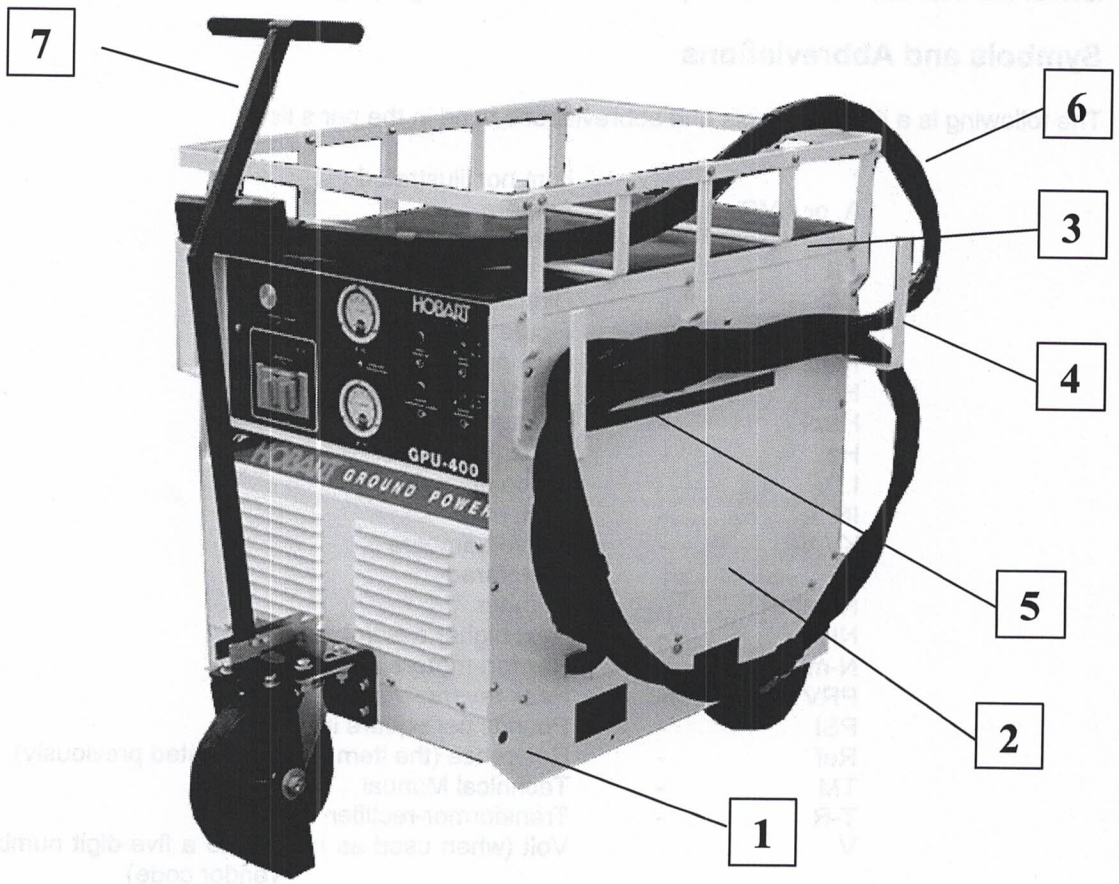
The parts list is arranged so that the illustration will appear on a left-hand page and the applicable parts list will appear on the opposite right-hand page. Unless the list is unusually long, the user will be able to look at the illustration and read the parts list without turning a page.

2) Symbols and Abbreviations

The following is a list of symbols and abbreviations used in the parts list:

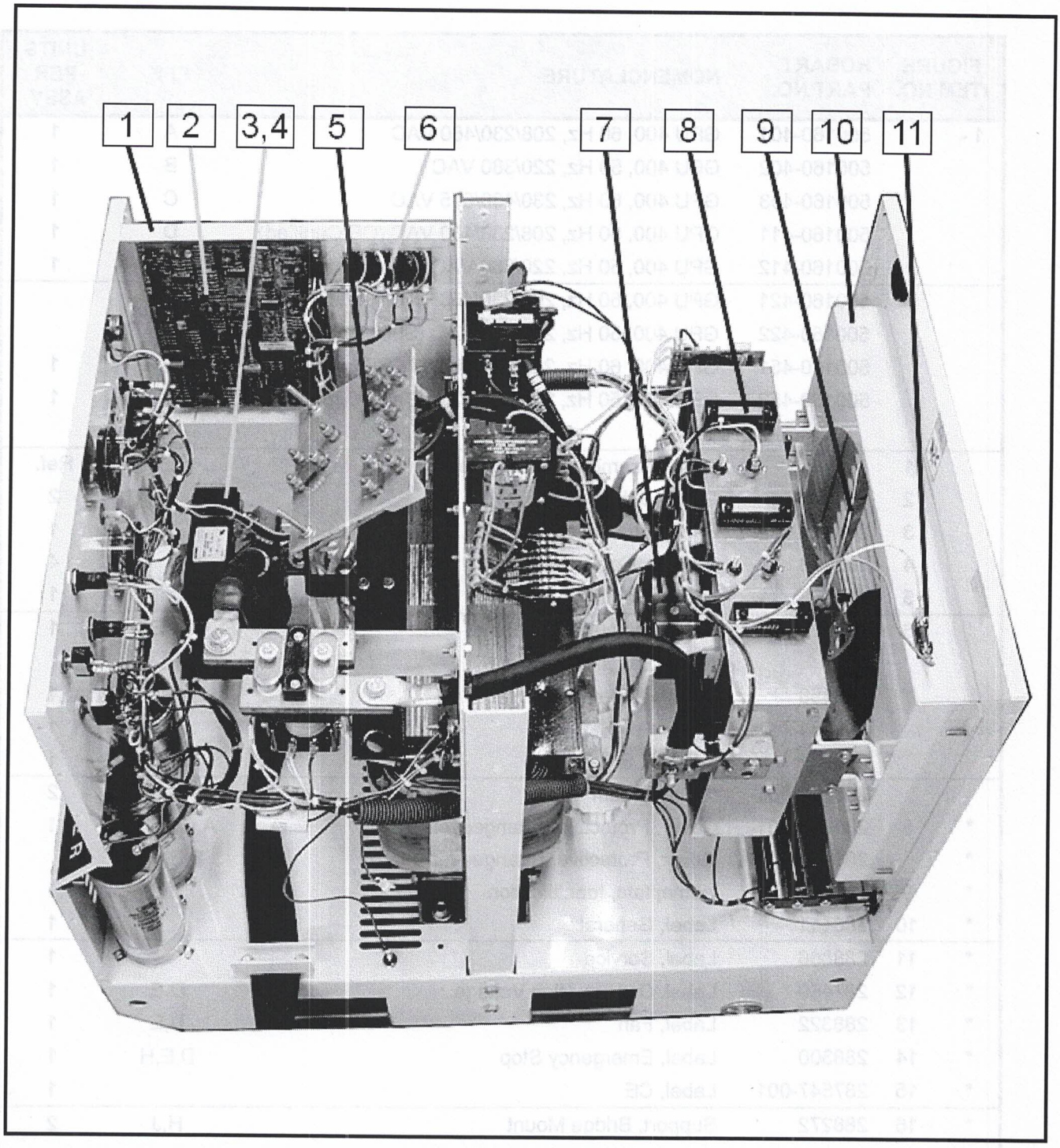
*	-	Item not illustrated
A, or AMP	-	Ampere
AC	-	Alternating current
AR	-	As required
DC	-	Direct current
Fig.	-	Figure
Ft-lb.	-	Foot-pounds
Hd.	-	Head
Hex	-	Hexagon
Hz	-	Hertz (cycles-per-second)
I.D.	-	Inside diameter
IN	-	Inch
KVA	-	Kilovolt-ampere
UF	-	Microfarad
Number	-	Number
NHA	-	Next higher assembly
N-m	-	Newton-meters
PRV	-	Peak reverse voltage
PSI	-	Pounds per square inch
Ref	-	Reference (the item has been listed previously)
TM	-	Technical Manual
T-R	-	Transformer-rectifier
V	-	Volt (when used as a prefix to a five-digit number, indicates vendor code)

NOTE: An item which does not reflect an index number is an assembly which is not illustrated in its assembled state, or it is similar (right-hand, left-hand, top, etc.) to an item which is illustrated.



Final Assembly of GPU-400 Power Supply
Figure 1

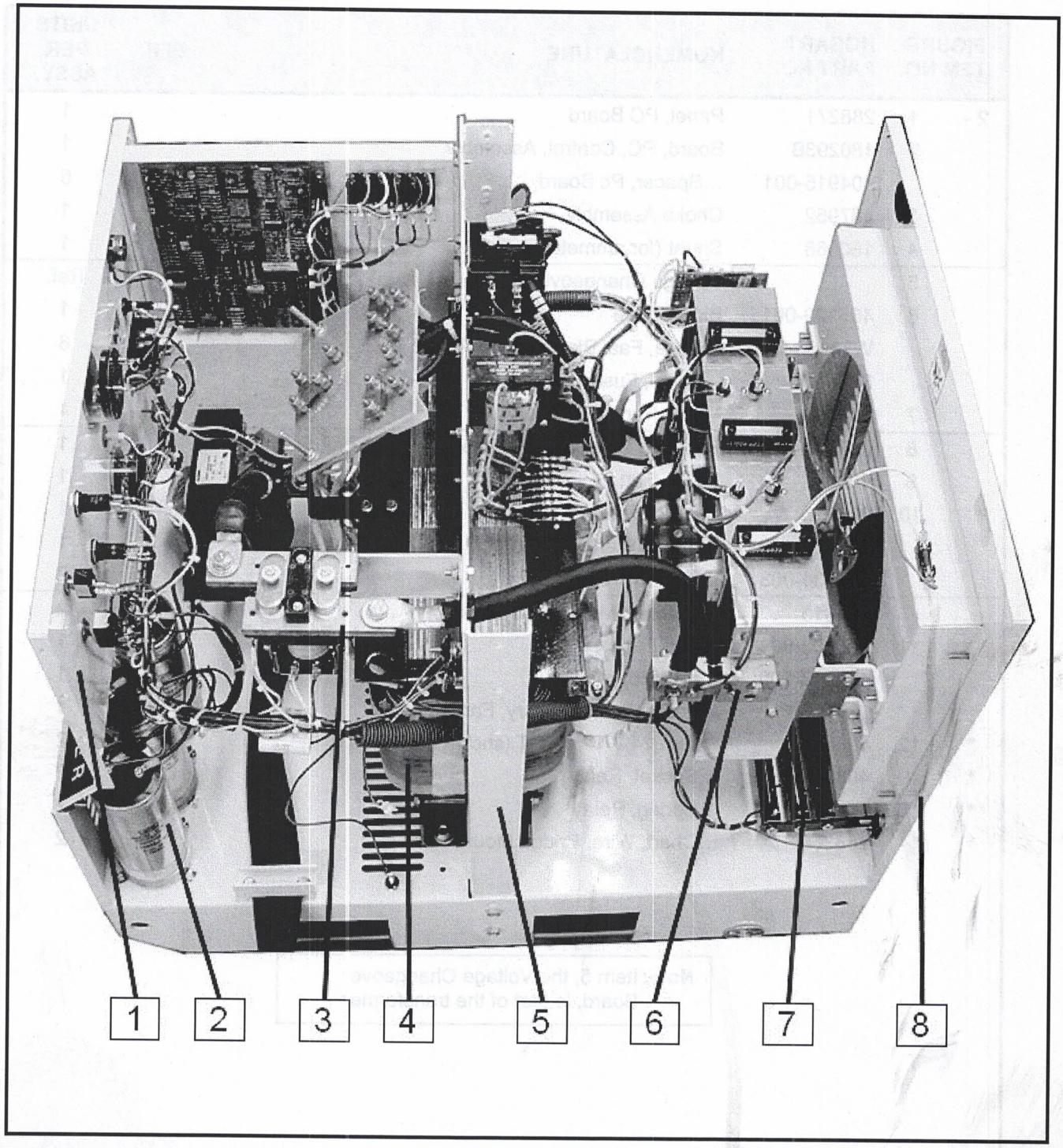
FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE	EFF	UNITS PER ASSY.
1 -	500160-401	GPU 400, 60 Hz, 208/230/460 VAC	A	1
	500160-402	GPU 400, 50 Hz, 220/380 VAC	B	1
	500160-403	GPU 400, 60 Hz, 230/460/575 VAC	C	1
	500160-411	GPU 400, 60 Hz, 208/230/460 VAC (CE Certified)	D	1
	500160-412	GPU 400, 50 Hz, 220/380 VAC (CE Certified)	E	1
	500160-421	GPU 400, 60 Hz, 208/230/460 VAC (Stationary)	F	
	500160-422	GPU 400, 50 Hz, 220/380 VAC (Stationary)	G	
	500160-451	GPU 400, 60 Hz, 208/230/460 VAC (Bridge Mount)	H	1
	500160-452	GPU 400, 50 Hz, 220/380 VAC (Bridge Mount)	J	1
1		Base Assembly (See Figure 4)		Ref.
2	288267	Panel, Side		2
3	288266	Panel, Top		1
4	283323	Bracket, Cable Hanger		4
5	282658	Label, Warning Clearance		1
6	402025-002	Cable, Output, 28 V , 20 ft	A-E	1
		[Other Lengths Available]		
7	288356	Handle Assembly	A-G	1
	288284	...Handle, 5th Wheel	A-G	1
	288281	...Latch, 5th Wheel	A-G	1
	288298-001	...Grip, Foam	A-G	2
* 8	288362-001	Cover, Protective, Changeover Board	A,C,D,F,H	1
*	288362-002	Cover, Protective, Changeover Board	B,E,G,J	
* 9	78B1130	Nameplate, Identification		1
* 10	286441	Label, General		1
* 11	288866	Label, Service		1
* 12	287460	Label, Danger, High Voltage	D,E	1
* 13	288322	Label, Fan	D,E	1
* 14	288300	Label, Emergency Stop	D,E,H	1
* 15	287547-001	Label, CE		1
* 16	288272	Support, Bridge Mount	H,J	2
* 17	288542	Shield, Control Box		1



Internal Components – Part 1
Figure 2

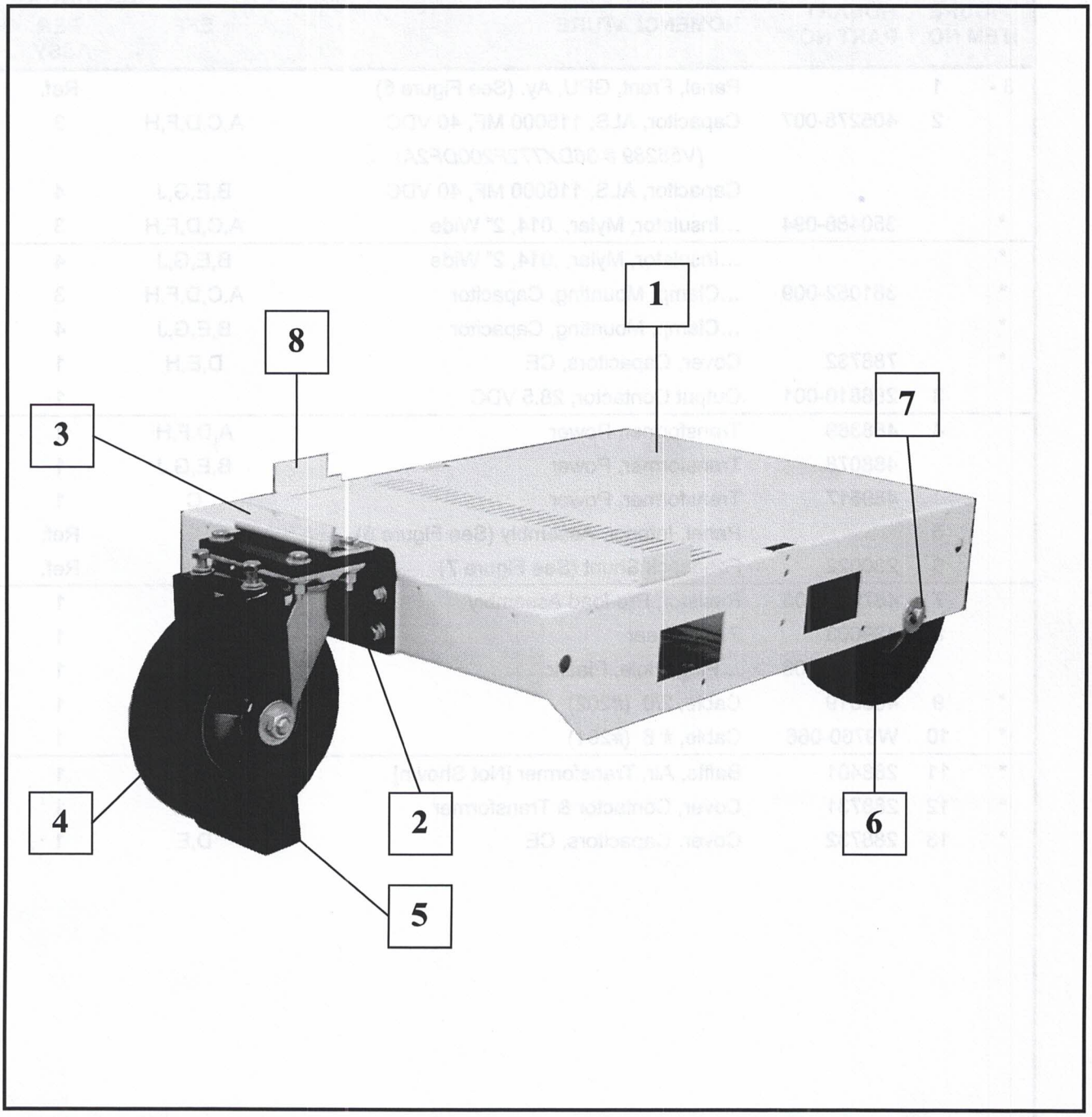
FIGURE ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	UNITS PER ASSY.
2 -	1	288271	Panel, PC Board		1
	2	180293B	Board, PC, Control, Assembly		1
		404915-001	...Spacer, Pc Board		6
	3	487952	Choke Assembly		1
	4	180068	Shunt (for ammeter)		1
	5		Voltage Changeover Board (see note)		Ref.
	6	405129-001	Block, Fuse		1
		W11166-009	...Fuse, Fast Blow, AGC 1 A, 250 V		6
		83A1105	...Label, Fuse		1
	7	287637	Motor, Fan		1
	8	288305-001	Rectifier, Output, SCR Assembly (See Figure 7)		1
	9	406991	Blade, Fan		1
	10	201016	Shroud, Fan		1
		288322	...Label, Warning, Fan		1
		400234-003	...Tag, Instructions		2
		201015	...Bracket, Mounting, Fan Shroud		2
	11	288303-001	Block, Fuse		1
		400647-005	...Fuse, 5 A		1
		288363	...Label, Precautionary, Fan Fuse		1
*	12	408567	Relay, 24 VAC, 4PDT (shown on Figure 6)	H,J,K	2
*		408352	...Socket, Relay	H,J,K	2
*		408585	...Spring, Relay	H,J,K	2
*		288366	...Chart, Wire, Bridge Mount Units	H,J,K	2

Note: Item 5, the Voltage Changeover Board, is part of the transformer



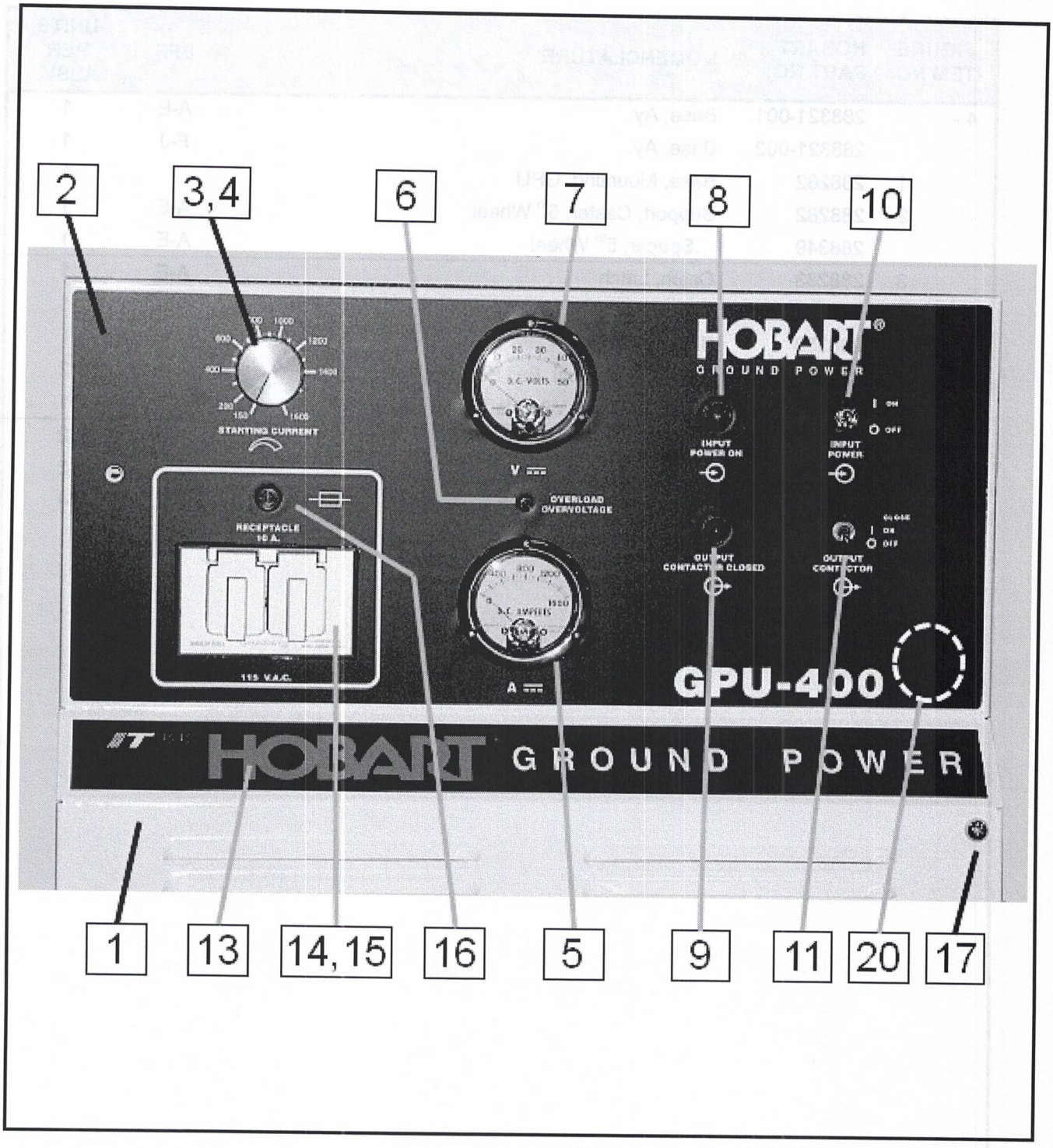
Internal Components – Part 2
Figure 3

FIGURE ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	UNITS PER ASSY.
3 -	1		Panel, Front, GPU, Ay. (See Figure 5)		Ref.
	2	405278-007	Capacitor, ALS, 115000 MF, 40 VDC	A,C,D,F,H	3
			(V56289 # 36DX772F200DF2A)		
			Capacitor, ALS, 115000 MF, 40 VDC	B,E,G,J	4
*		350488-094	...Insulator, Mylar, .014, 2" Wide	A,C,D,F,H	3
*			...Insulator, Mylar, .014, 2" Wide	B,E,G,J	4
*		361052-009	...Clamp, Mounting, Capacitor	A,C,D,F,H	3
*			...Clamp, Mounting, Capacitor	B,E,G,J	4
*		788732	Cover, Capacitors, CE	D,E,H	1
	3	286810-001	Output Contactor, 28.5 VDC		1
	4	488389	Transformer, Power	A,D,F,H	1
		488078	Transformer, Power	B,E,G,J	1
		489517	Transformer, Power	C	1
	5		Panel, Interior Assembly (See Figure 6)		Ref.
	6	280022	Feedback Shunt (See Figure 7)		Ref.
	7	487050-005	Resistor, Pre-load Assembly		1
	8	489603	Panel, Rear		1
		403091-008	...Plug, Hole, Plastic		1
*	9	488819	Cable, 2/0 (#202)		1
*	10	W9760-066	Cable, # 6 (#201)		1
*	11	288401	Baffle, Air, Transformer [Not Shown]		1
*	12	288731	Cover, Contactor & Transformer	E	1
*	13	288732	Cover, Capacitors, CE	D,E	1



Base Assembly
Figure 4

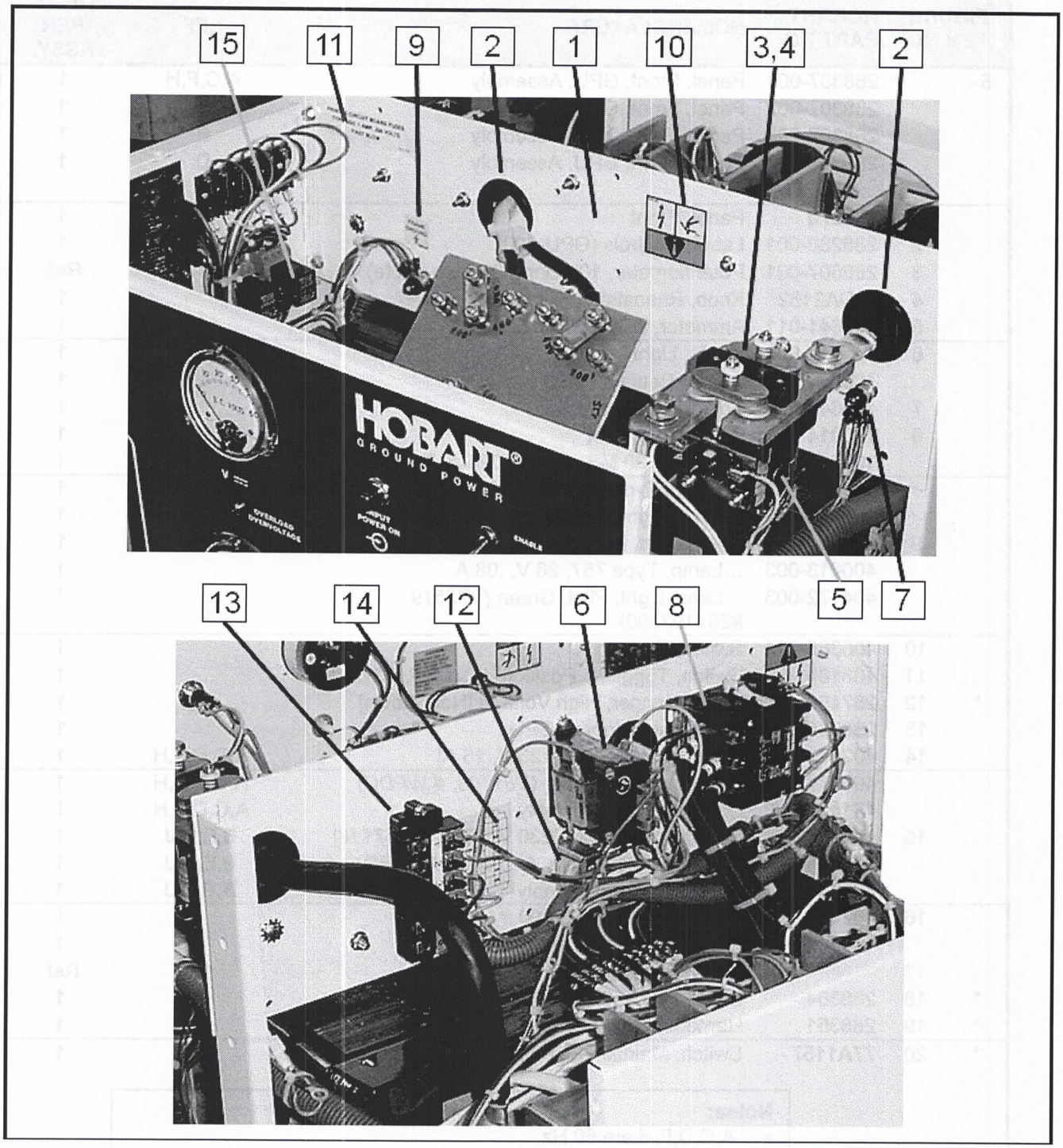
FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE	EFF	UNITS PER ASSY.
4 -	288321-001	Base, Ay.	A-E	1
	288321-002	Base, Ay.	F-J	1
1	288262	Base, Mounting, GPU		1
2	288282	Support, Caster, 5th Wheel	A-E	1
	288349	...Spacer, 5th Wheel	A-E	1
3	288283	Catch, Latch	A-E	1
4	288297-1	Kit, Caster	A-E	1
5	288353	Brake, 5th Wheel	A-E	1
6	83B1101	Tire, Symmetrical, Ball Bearing, 10°	A-E	2
7	288251	Axle, Mounting, Wheels	A-E	1
	486143-2	...Spacer, Black, Pipe	A-E	2
8	283322	Bracket, Output, Cable		2
	489971	...Spacer, Output Cable		4



Front Panel Assembly
Figure 5

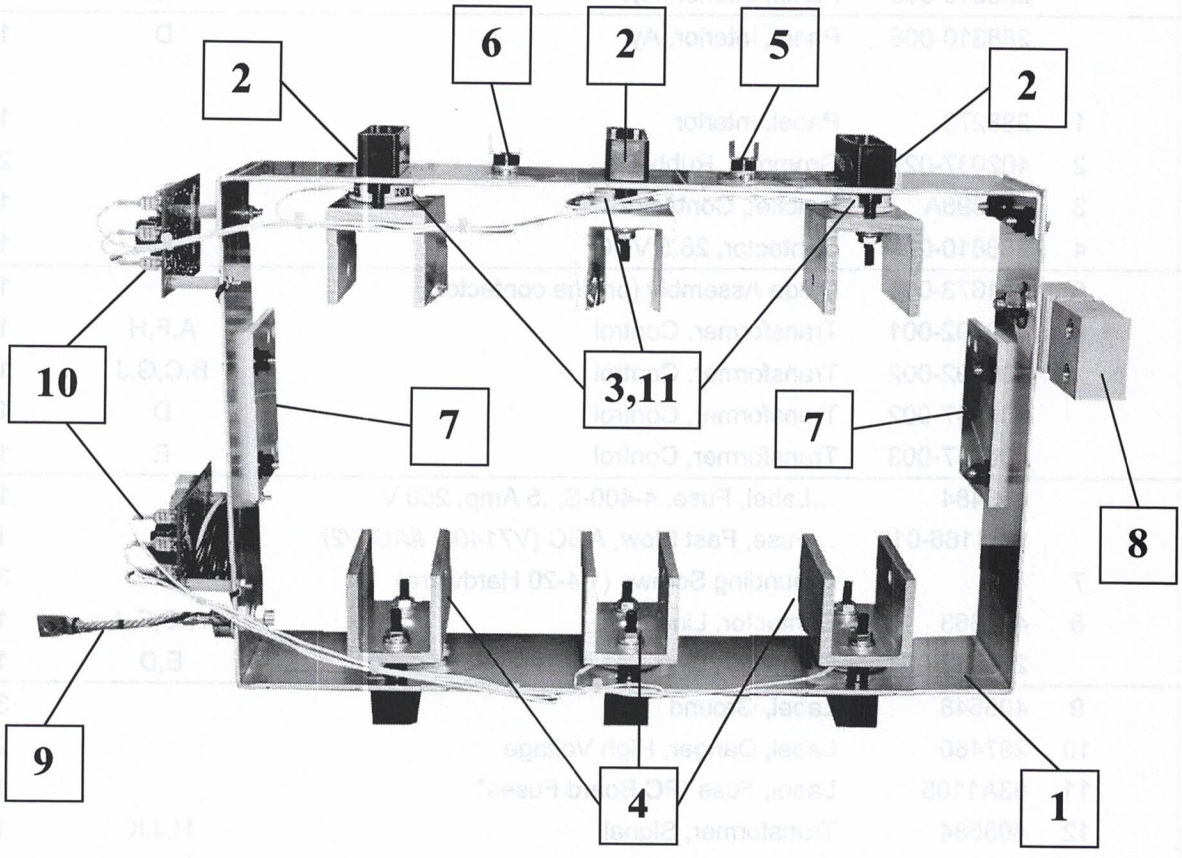
FIGURE ITEM NO.		HOBART PART NO.	NOMENCLATURE	EFF	UNITS PER ASSY.
5 -		288307-001	Panel, Front, GPU, Assembly	A,C,F,H	1
		288307-002	Panel, Front, GPU, Assembly	B,G,J	1
		288307-005	Panel, Front, GPU, Assembly	E	1
		288307-007	Panel, Front, GPU, Assembly	D	1
	1	288270	Panel, Front		1
	2	288280-001	Label, Controls (GPU-400)		1
	3	286607-001	Potentiometer, 10k Ohm, 2 W (see note)		Ref.
	4	16DA2162	Knob, Rheostat *(V44655 #5150)*		1
	5	400641-011	Ammeter, DC, 0-1600, 50 mV Movement		1
	6	405072-002	Diode, Light		1
		405734	...Clip, Retainer, LED		1
	7	400642-003	Voltmeter, DC		1
	8	180914	Base, Light, Pilot		1
		400613-006	...Lamp, 120 MB, 120 V, .025 A, T-2-1/2	A-C,F-J	1
		400613-003	...Lamp, Type 757, 28 V, .08 A	D,E	1
		404172-002	...Lens, Light, Pilot, Amber *(V72619)*		1
	9	180914	Base, Light, Pilot		1
		400613-003	...Lamp, Type 757, 28 V, .08 A		1
		404172-003	...Lens, Light, Pilot, Green *(V72619 #261193300)*		1
	10	405365-001	Switch, Toggle		1
	11	403189	Switch, Toggle, 3 Position *(V91929, #312TS)*		1
*	12	287460	Label, Danger, High Voltage [Not Shown]		1
	13	288365	Nameplate, Hobart, GPU		1
	14	402670	Receptacle, 3-Wire [125 V, 15 A]	A,C,D,F,H	1
		404277	...Cover, Receptacle *(V81703, # WPDC)*	A,C,D,F,H	1
		401532-002	...Suppressor Assembly	A,C,D,F,H	1
	15	404336	Receptacle, 3-Wire [230 V, 15 A] *(V77116)*	B,E,G,J	1
		404335	...Cover, Receptacle *(V81703,#* WPRC)	B,E,G,J	1
		403955-017	...Suppressor Assembly	B,E,G,J	1
	16	402658	Holder, Fuse *(V71400 # HKP-HH)*		1
		400647-008	...Fuse, 10 A *(V71400 # ABC-10)*		1
	17		Grounding Hardware		Ref.
*	18	288364	Label, Precautionary, Recpt., Fuse		1
*	19	288351	Harness, Wire [not shown]		1
*	20	77A1157	Switch, Maintained, Push/Pull	D,E	1

Notes:
- A,C,D,F,H are 60 Hz.
- B,E,G,J are 50 Hz.
- Potentiometer (item 3) is included with wire harness (item 19)



Interior Panel Assembly (shown with bridge mount option)
Figure 6

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE	EFF	UNITS PER ASSY.
6 -	288310-001	Panel, Interior, Ay.	A,F	1
	288310-002	Panel, Interior, Ay.	B,C,G	1
	288310-003	Panel, Interior, Ay.	H	1
	288310-004	Panel, Interior, Ay.	J	1
	288310-005	Panel, Interior, Ay.	E	1
	288310-006	Panel, Interior, Ay.	D	1
1	288273	Panel, Interior		1
2	402037-027	Grommet, Rubber		2
3	487898A	Bracket, Contactor		1
4	286810-001	Contactor, 28.5 VDC		1
5	201673-004	Diode Assembly (on line contactor)		1
6	406392-001	Transformer, Control	A,F,H	1
	406392-002	Transformer, Control	B,C,G,J	1
	406247-002	Transformer, Control	D	1
	406247-003	Transformer, Control	E	1
	406484	…Label, Fuse, 4-400-S, .5 Amp, 250 V		1
	W11166-011	…Fuse, Fast Blow, AGC *(V71400 #AGC/2)*		1
7		Grounding Screws (1/4-20 Hardware)		3
8	400663	Contactor, Line	A-C,F-J	1
	288733-001	Contactor, Line	E,D	1
9	405548	Label, Ground		3
10	287460	Label, Danger, High Voltage		2
11	83A1105	Label, Fuse “PC Board Fuses”		1
12	408584	Transformer, Signal	H,J,K	1
13	283066-001	Block, Terminal, 6 Position	H,J,K	1
14	286432-001	Label, Bridge Interlock	H,J,K	1
15		Relays for bridge mount (see Figure 2)	H,J,K	Ref



SCR Output Rectifier Assembly of GPU-400 Power Supply
Figure 7

FIGURE ITEM NO.	HOBART PART NO.	NOMENCLATURE	EFF	UNITS PER ASSY.
7 -	288305-001	Rectifier, Output, SCR Assembly		Ref.
1	288277	Heat Sink, Rectifier		1
2	405140-001	Clamp, Mounting		6
3	405139	Rectifier, Silicon, Cont.		6
4	369642	Heat Sink, SCR		6
5	287929-001	Thermostat, Overload		1
6	404044-006	Thermostat, Fan Turn On		1
7	369641	Insulator, Mounting, Rectifier		2
8	280022	Shunt, 800A, 50 mV, Assembly		1
9	402832-003	Diode, Silicon, 150 A, Pos Base		1
10	367634A-003	Suppressor, Surge, Assembly		2
11	16DA954-012	Pin, Spring		6

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Section 4 Numerical Index

1) Explanation of Numerical Index

The purpose of this index is to assist the user in finding the illustration and description of a part when the part number is known. Part numbers are arranged in alphanumerical sequence.

FIGURE – ITEM NO.	HOBART PART NO.
5-4	16DA2162
7-11	16DA954-012
2-4	180068
2-2	180293B
5-8	180914
5-9	180914
2-	201015
2-10	201016
6-5	201673-004
3-6	280022
7-8	280022
1-5	282658
6-13	283066-001
4-8	283322
1-4	283323
6-14	286432-001
1-10	286441
5-3	286607-001
3-3	286810-001
6-4	286810-001
1-12	287460
5-12	287460
6-10	287460
1-15	287547-001
2-7	287637
7-5	287929-001
4-7	288251
4-1	288262
1-3	288266
1-2	288267
5-1	288270
2-1	288271
1-16	288272
6-1	288273
7-1	288277
5-2	288280-001

FIGURE – ITEM NO.	HOBART PART NO.
1-	288281
4-2	288282
4-3	288283
1-	288284
4-4	288297-1
1-	288298-001
1-14	288300
2-11	288303-001
2-8	288305-001
7-	288305-001
5-	288307-001
5-	288307-002
5-	288307-005
5-	288307-007
6-	288310-001
6-	288310-002
6-	288310-003
6-	288310-004
6-	288310-005
6-	288310-006
4-	288321-001
4-	288321-002
1-13	288322
2-	288322
4-	288349
5-19	288351
4-5	288353
1-7	288356
1-8	288362-001
1-	288362-002
2-	288363
5-18	288364
5-13	288365
2-	288366
3-11	288401
1-17	288542

FIGURE – ITEM NO.	HOBART PART NO.
3-12	288731
3-13	288732
6-	288733-001
1-11	288866
3-	350488-094
3-	361052-009
7-10	367634A-003
7-7	369641
7-4	369642
2-	400234-003
5-	400613-003
5-	400613-006
5-5	400641-011
5-7	400642-003
2-	400647-005
5-	400647-008
6-8	400663
5-	401532-002
1-6	402025-002
6-2	402037-027
5-16	402658
5-14	402670
7-9	402832-003
3-	403091-008
5-11	403189
5-	403955-017
7-6	404044-006
5-	404172-002
5-	404172-003
5-	404277
5-	404335
5-15	404336
2-	404915-001
5-6	405072-002
2-6	405129-001
7-3	405139
7-2	405140-001
3-2	405278-007
5-10	405365-001
6-9	405548
5-	405734
6-	406247-002
6-	406247-003

FIGURE – ITEM NO.	HOBART PART NO.
6-6	406392-001
6-	406392-002
6-	406484
2-9	406991
2-	408352
2-12	408567
6-12	408584
2-	408585
4-	486143-2
3-7	487050-005
6-3	487898A
2-3	487952
3-	488078
3-4	488389
3-9	488819
3-	489517
3-8	489603
4-	489971
1-	500160-401
1-	500160-402
1-	500160-403
1-	500160-411
1-	500160-412
1-	500160-421
1-	500160-422
1-	500160-451
1-	500160-452
5-20	77A1157
3-	788732
1-9	78B1130
2-	83A1105
6-11	83A1105
4-6	83B1101
2-	W11166-009
6-	W11166-011
3-10	W9760-066

Chapter 5 Manufacturer's Literature

Diagram Number	Diagram Description
288326, Rev. 0	Outline, Dimensional/Installation
288367, Rev. 11	Diagram, Schematic & Connection

Contact Hobart Ground Power if copies of these drawings are not with this manual. Refer to Appendix A for specific information on GPU-400 Solid State Transformer-Rectifier optional equipment.

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NOTES:

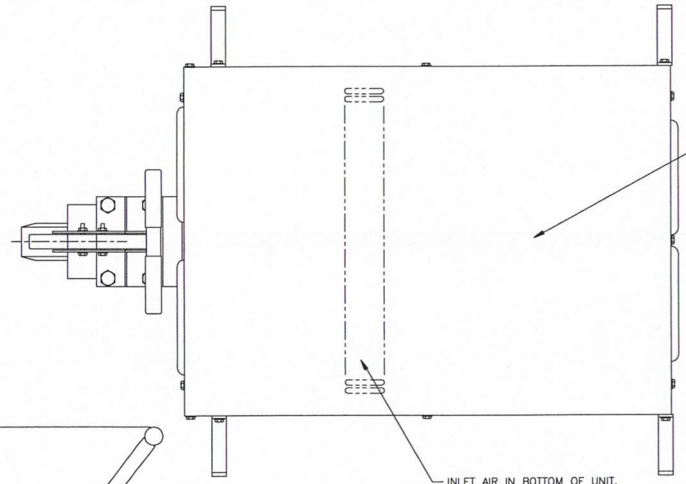
1. FIRST DIMENSION IN INCHES, [ ] MILLIMETERS.
2. 5TH WHEEL STEERING WITH TONGUE ACTUATED PARKING BRAKE.
3. 10" DIAMETER WHEELS, SOLID RUBBER TIRES.
4. CONVENIENCE RECEPTACLE AND ITS FUSE IS LOCATED ON FRONT PANEL. THE FUSE FOR THE FAN IS LOCATED ON FAN SHROUD, AND OTHER MISC. FUSES ARE BEHIND THE FRONT PANEL ADJACENT TO THE P.C. BOARD.
5. 14.25 VOLT AVAILABLE WITH GPU 400.

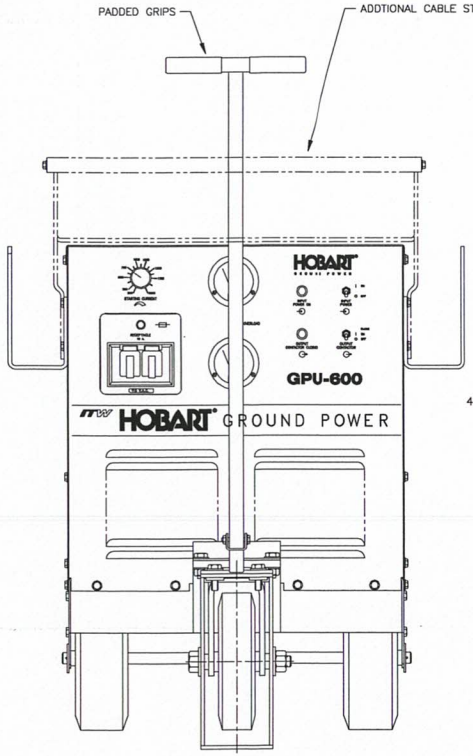
⚠6 1-3/4" DIA. HOLE PROVIDED, USE WATERTIGHT STRAIN RELIEF IF UNIT WILL BE USED OUTDOORS. INPUT CABLE CONNECTIONS LOCATED ON INTERIOR PANEL, 18.0 [458] BEHIND CABLE ENTRANCE. A SCREW DRIVER AND A 9/16 WRENCH REQUIRED.

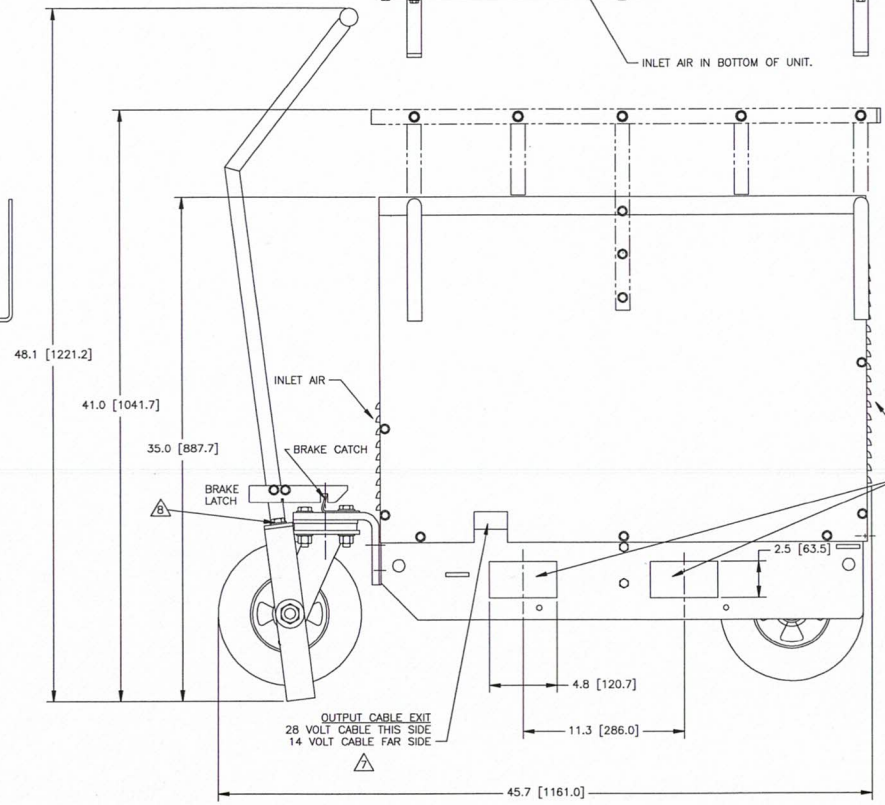
⚠7 NEGATIVE OUTPUT CABLE CONNECTION LOCATED ON SHUNT AND POSITIVE CABLE CONNECTION LOCATED ON CONTACTOR, 9/16 SOCKET AND WRENCH REQUIRED.

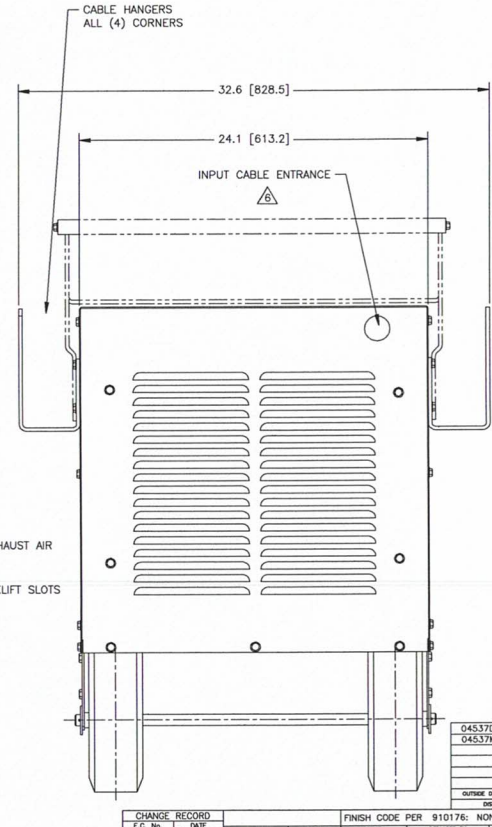
⚠8 ASSEMBLE HANDLE TO WHEEL ASSEMBLY WITH HARDWARE PROVIDED. 3/4 WRENCH AND SOCKET REQUIRED. LOOSEN TWO BOLTS TO ADJUST BRAKE CATCH IF REQUIRED.

MODEL	WEIGHTS
GPU 400	450 lbs. 204 kg.
GPU 600	650 lbs. 295 kg









045137DCS	9-01
045137MTL	9-01

OUTSIDE DISTR.

DISTRIBUTION TABLE

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UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES/MILLIMETERS
TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS PRODUCED TO RECOGNIZED STANDARDS.
DO NOT SCALE DRAWING.

FRACT ±	ANGLES ± 3°
DECIMAL-INCH	METRIC
.00 ± .03	0.0 ±0.8mm
.000 ± .010	0.00 ±0.25mm

FINISH CODE PER 910176: NONE

ACTIVITY | REPLACED BY | REPLACES
MATERIAL NO. | QUANTITY-U.M. | COMM. CLS.
MATERIAL SPEC.

TITLE: OUTLINE, DIMENSIONAL, INSTALLATION

DESCRIPTIVE DATA: GPU

DESIGNED	DRAWN	DATE	SCALE
RPH	RPH	7/10/01	QUARTER
CHECKED	APPROVED	REVISED 9-18-01	ITEM TYPE

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HOBART® TROY, OHIO 45373 U.S.A.

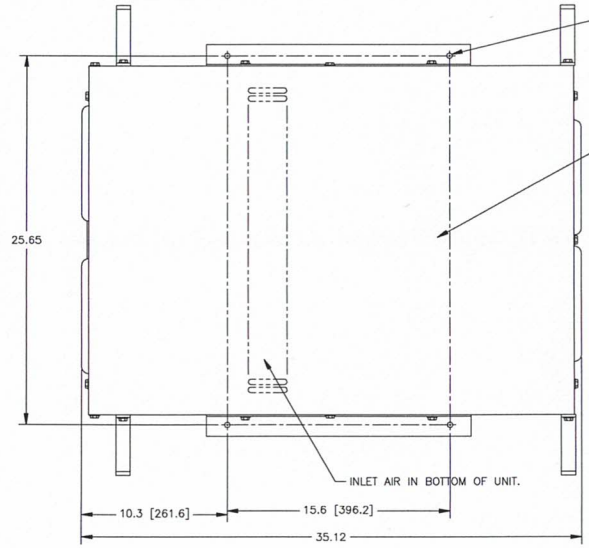
SIZE D | DWG. NO. 288326 | SHEET 1 OF 4

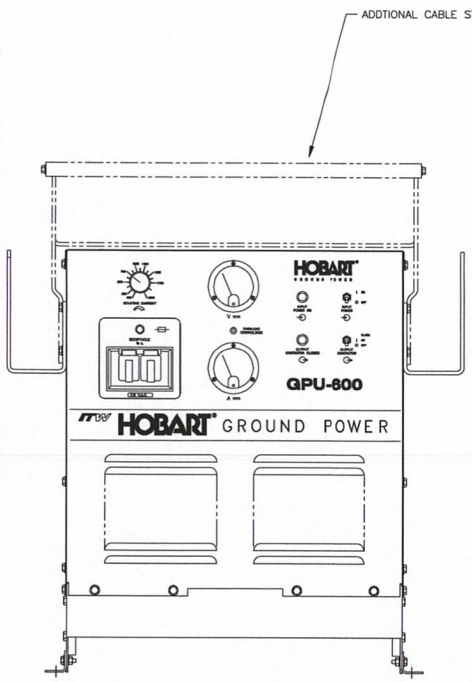
NOTES:

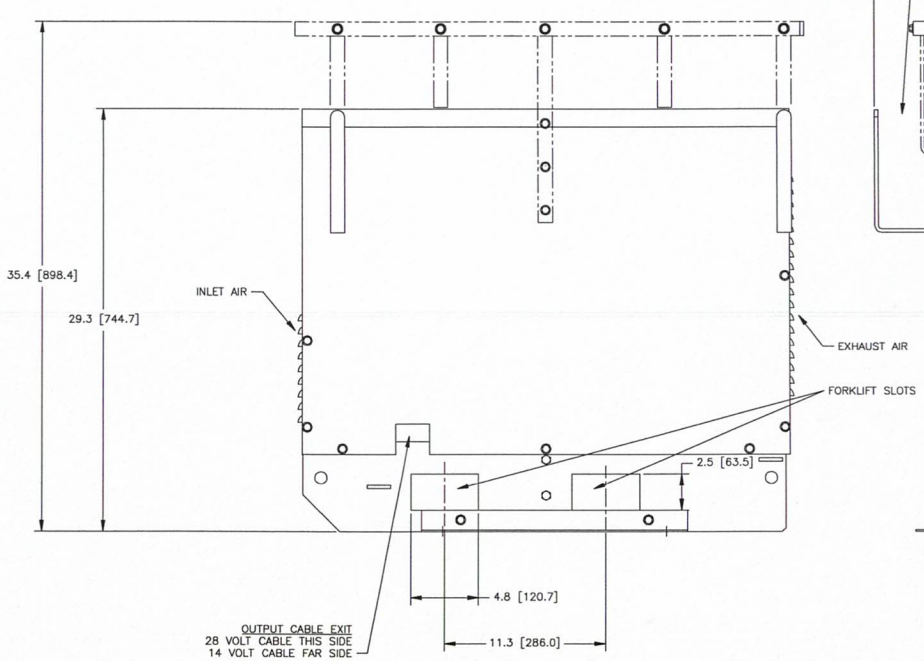
1. FIRST DIMENSION IN INCHES, [ ] MILLIMETERS.
2. CONVENIENCE RECEPTACLE AND ITS FUSE IS LOCATED ON FRONT PANEL. THE FUSE FOR THE FAN IS LOCATED ON FAN SHROUD, AND OTHER MISC. FUSES ARE BEHIND THE FRONT PANEL ADJACENT TO THE P.C. BOARD.
3. 14.25 VOLT AVAILABLE WITH GPU 400.

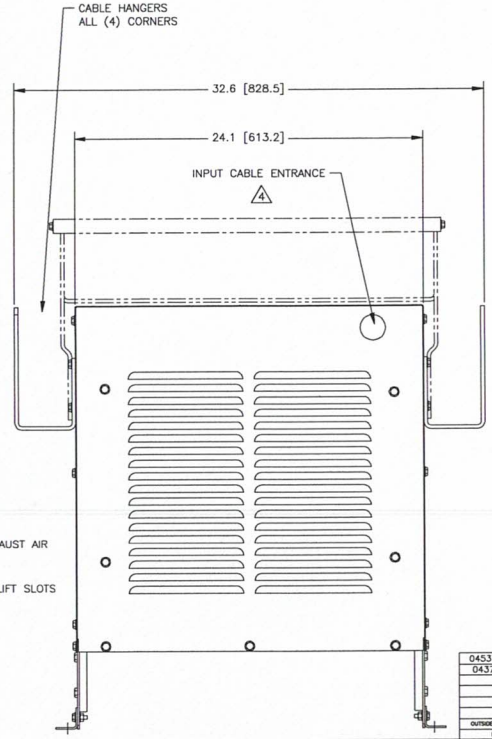
4. 1-3/4" DIA. HOLE PROVIDED, USE WATERTIGHT STRAIN RELIEF IF UNIT WILL BE USED OUTDOORS. INPUT CABLE CONNECTIONS LOCATED ON INTERIOR PANEL, 18.0 [458] BEHIND CABLE ENTRANCE. A SCREW DRIVER AND A 9/16 WRENCH REQUIRED.

5. NEGATIVE OUTPUT CABLE CONNECTION LOCATED ON SHUNT AND POSITIVE CABLE CONNECTION LOCATED ON CONTACTOR, 9/16 SOCKET AND WRENCH REQUIRED.









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0437MTL	9-01

OUTSIDE DISTR.

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				MATERIAL SPEC.		
		FRACT ±	ANGLES ± 3°	TITLE		
		DECIMAL-INCH	METRIC	OUTLINE, DIMENSIONAL, INSTALLATION		
		.00 ± .03	0.0 ±0.8mm	DESCRIPTIVE DATA		
		.000 ± .010	0.00 ±0.25mm	GPU STATIONARY UNIT		
				DESIGNED RPH	DRAWN RPH	DATE 9/4/01
				CHECKED	APPROVED	RECORDED 9-18-01
						SCALE QUARTER
						ITEM TYPE

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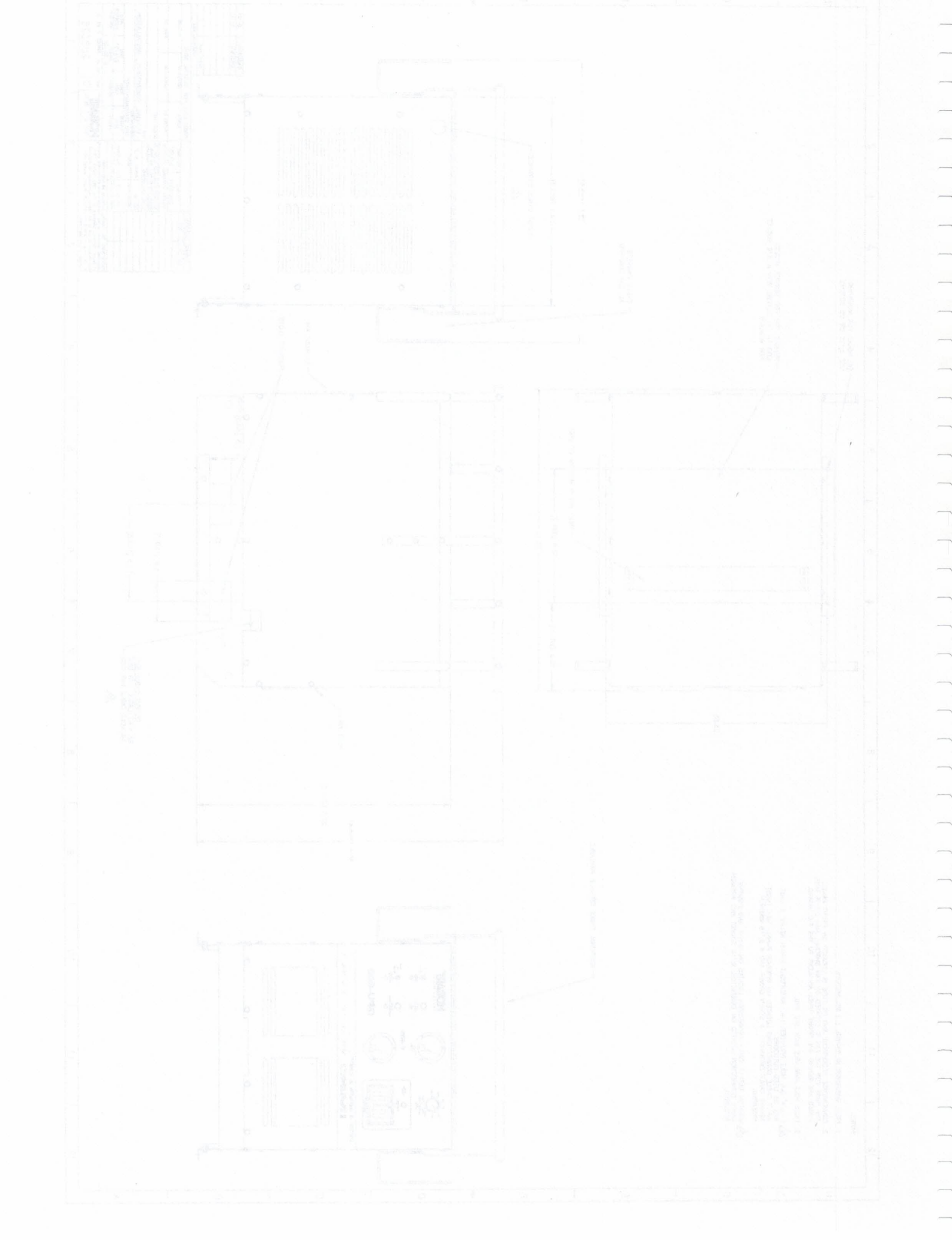
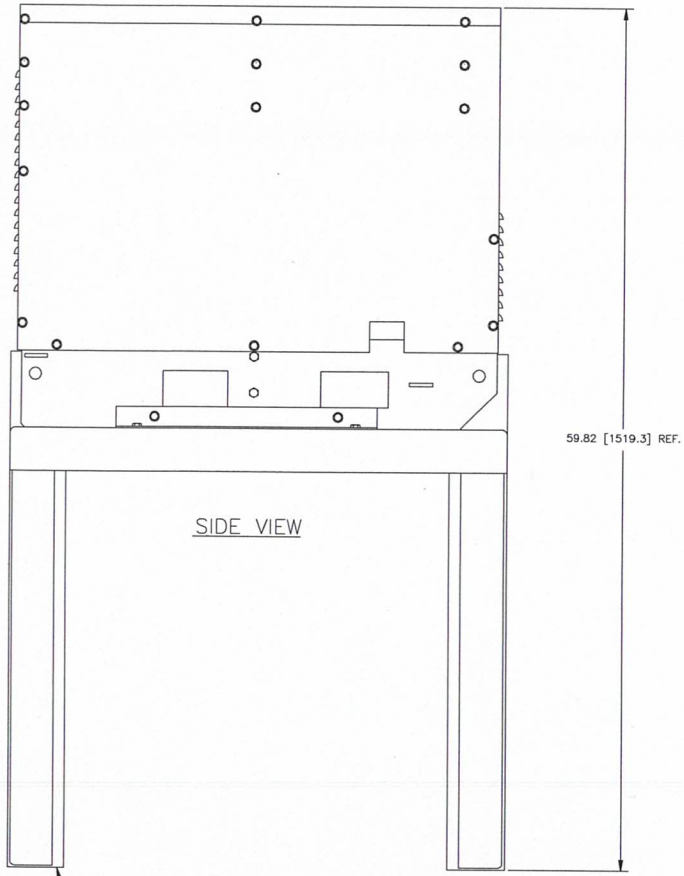
HOBART TROY, OHIO 45373 U.S.A.

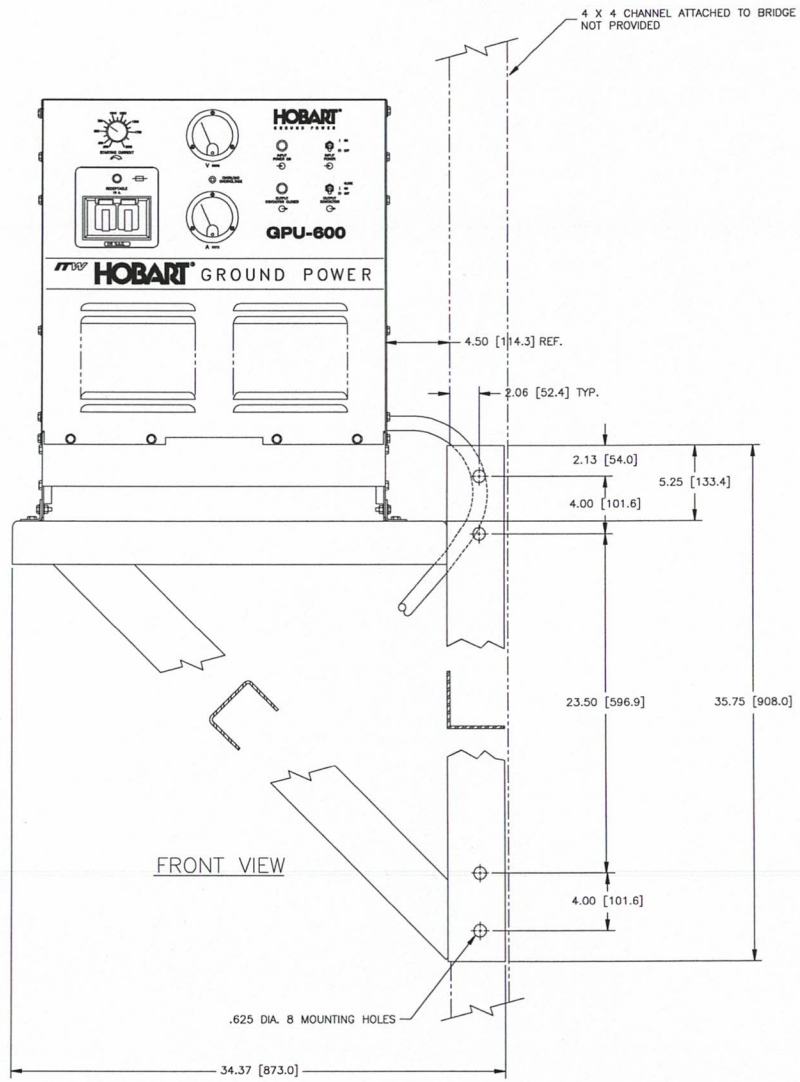
SIZE D

DWG. NO. 288326

SHEET 2 OF 3







NOTE: INCHES [mm]

04537DCS	9-01
04537MTL	9-01

DISTRIBUTION TABLE
OUTSIDE DISTR.

CHANGE RECORD

E.C. No.	DATE

FILE NAME: 288326s3 | PLOT DATE: 9/7/01

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES/MILLIMETERS
TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS PRODUCED TO RECOGNIZED STANDARDS.
DO NOT SCALE DRAWING.

FRACT ± | ANGLES ± 3°

DECIMAL-INCH	METRIC
.00 ± .03	0.0 ±0.8mm
.000 ± .010	0.00 ±0.25mm

FINISH CODE PER 910176: NONE

ACTIVITY | REPLACED BY | REPLACES
MATERIAL NO. | QUANTITY-U.M. | COMM. CLS.
MATERIAL SPEC.
—

TITLE
OUTLINE, DIMENSIONAL, BRIDGE MTG

DESCRIPTIVE DATA
BRIDGE MOUNTED GPU-600

DESIGNED	DRAWN	DATE	SCALE
RPH	RPH	9/7/01	QUARTER
CHECKED	APPROVED	RECORDED	ITEM TYPE
		9-18-01	

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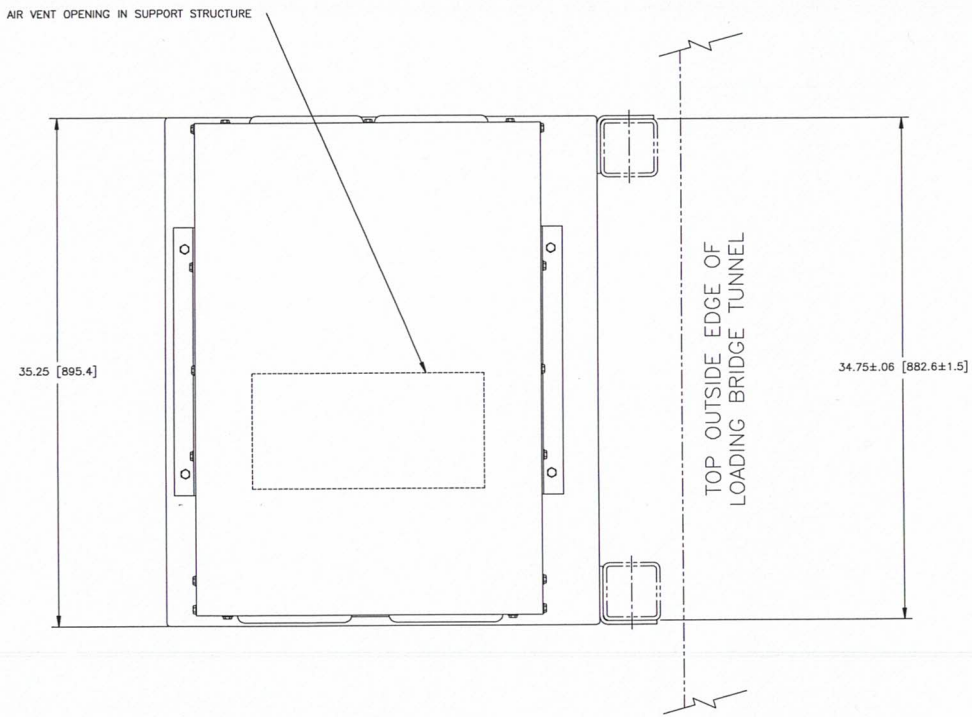
HOBART TROY, OHIO 45373 U.S.A.

SIZE D | DWG. NO. 288326 | SHEET 3 OF 4



TOP VIEW

NOTE: INCHES [mm]

04537DCS	9-01
04537MTL	9-01
OUTSIDE DISTR.	

DISTRIBUTION TABLE

CHANGE RECORD	
E.C. No.	DATE

FILE NAME	PLOT DATE
288326S4	9/7/01

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES/MILLIMETERS
TOLERANCES (UNLESS STATED EXCEPT FOR
MATERIAL AND HEAT TREATED PARTS AS ITEMS
PRODUCED TO RECOGNIZED STANDARDS.
DO NOT SCALE DRAWING.

FRACT. INCH ±	ANGLES ± 3°
DECIMAL-INCH	METRIC
.00 ± .03	0.0 ±0.8mm
.000 ± .010	0.00 ±0.25mm

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FINISH CODE PER 910176: NONE

ACTIVITY	REPLACED BY	REPLACES
MATERIAL NO.	QUANTITY-U.M.	COMM. CLS.

MATERIAL SPEC.
–

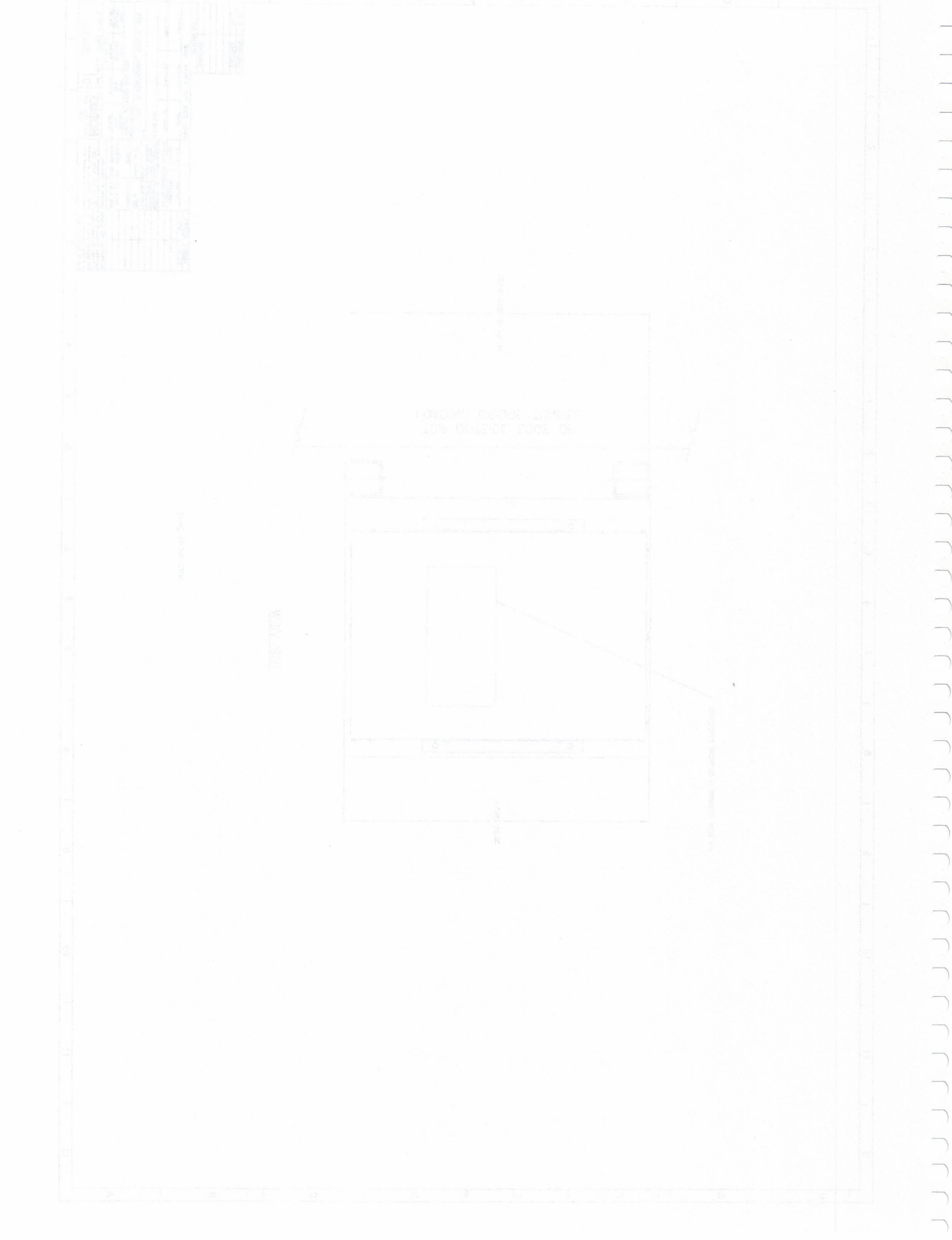
TITLE
OUTLINE, DIMENSIONAL, BRIDGE MTG

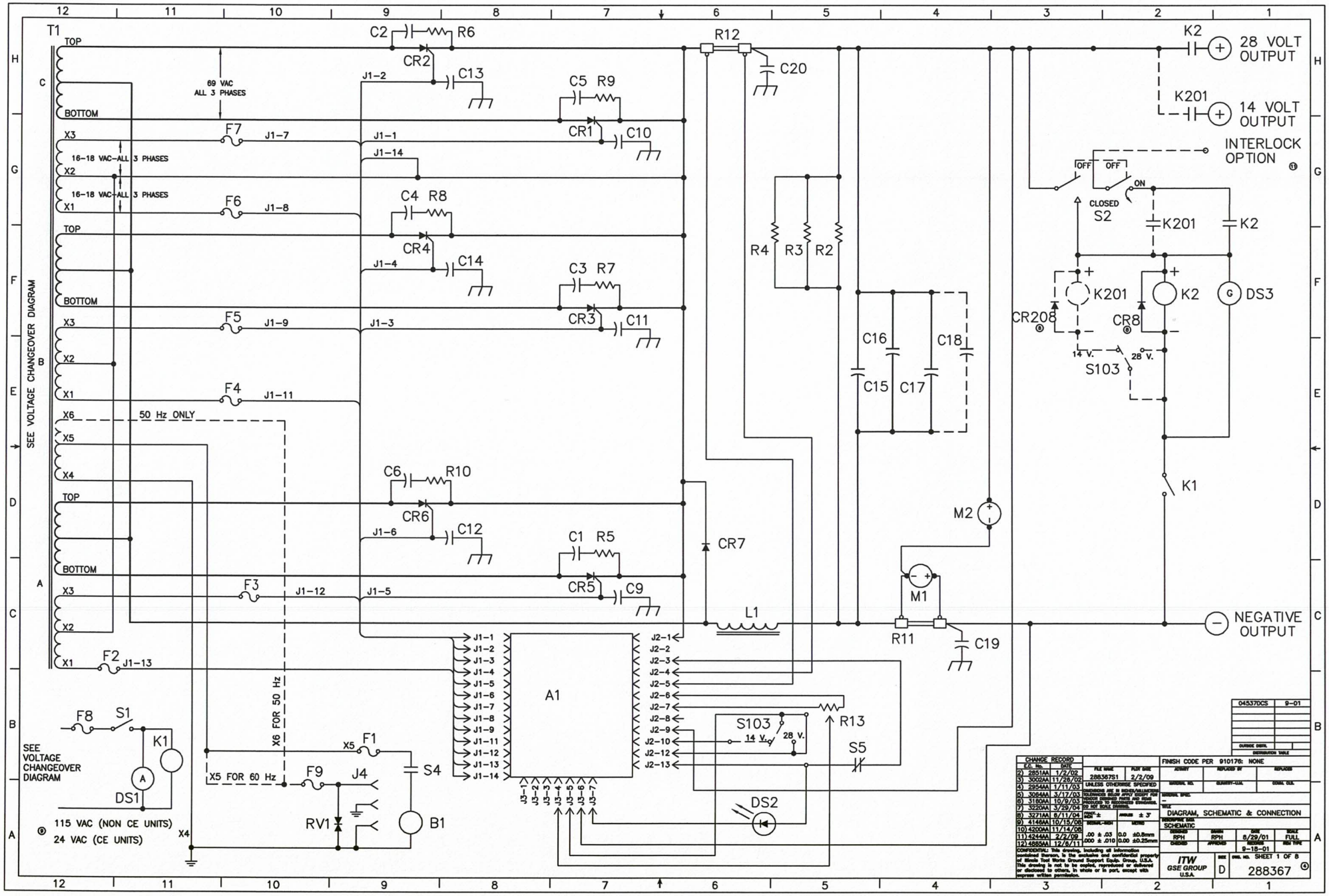
DESCRIPTIVE DATA
BRIDGE MOUNTED GPU-600

DESIGNED	DRAWN	DATE	SCALE
RPH	RPH	9/7/01	QUARTER
CHECKED	APPROVED	RECORDED 9-18-01	ITEM TYPE

HOBART®
TROY, OHIO 45373
U.S.A.

SIZE D | DWG. NO. 288326 | SHEET 4 OF 4





CHANGE RECORD				
E.C. No.	DATE	FILE NAME	PLOT DATE	
2) 2851AA	1/2/02	288367S1	2/2/09	
3) 3002AM	11/26/02	UNLESS OTHERWISE SPECIFIED		
4) 2954AA	1/11/03	DIMENSIONS ARE IN INCHES/MILLIMETERS		
5) 3084AA	3/17/03	TOLERANCES UNLESS OTHERWISE SPECIFIED		
6) 3180AA	10/9/03	DECIMALS ±	ANGLES ± 3°	
7) 3220AA	3/29/04	.XX ± .03	.X ± .5mm	
8) 3271AA	6/11/04	.XXX ± .010	.XX ± .25mm	
9) 4144AA	10/15/08			
10) 4200AA	11/14/08			
11) 4244AM	2/2/09			
12) 4885AA	12/6/11			

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04537DCS	9-01		
OUTSIDE SHOP			
DISTRIBUTION TABLE			

FINISH CODE PER 910176: NONE

ASSEMBLY	REPLACED BY	REPLACES	
MATERIAL NO.	ELEMENT-CLASS	COMM. CLASS	
MATERIAL SPEC.			
TITLE	DIAGRAM, SCHEMATIC & CONNECTION		
DESCRIPTIVE WORD	SCHEMATIC		
DESIGNED	DRAWN	DATE	SCALE
RPH	RPH	8/29/01	FULL
CHECKED	APPROVED	RELEASED	SIZE TYPE
		9-18-01	

ITW GSE GROUP U.S.A.

SIZE D | DWG. NO. 288367 | SHEET 1 OF 8

LEGEND

A1	BOARD, P.C., CONTROL	L1	CHOKE, FILTER REACTOR
A2, A3	BOARD, P.C., SUPPRESSOR		
		M1	AMMETER, 0–1600 AMPS GPU 400, 0–2000 AMPS GPU 600
B1	FAN MOTOR	M2	VOLTMETER, 0–50 VOLTS
C1–C6	CAPACITOR, SUPPRESSION, .047 MFD, 400 WVDC	P1	PLUG, PC BOARD, 14 SOCKETS
C9–C14	CAPACITOR, H.F. SUPPRESSION, .047 MFD, 400 WVDC	P2	PLUG, PC BOARD, 13 SOCKETS
C15–C17	CAPACITOR, FILTER, 115,000 MFD, 40 VDC	P3	PLUG, PC BOARD, 7 SOCKETS
C18	CAPACITOR, FILTER, 115,000 MFD, 40 VDC, (50 Hz. ONLY) (WHEN FURNISHED)	P5–P7	PLUG, GROUNDING PANELS
C19, C20	CAPACITOR, SUPPRESSOR, .047 MFD, 1200 VdC		
⑫ CB1	CIRCUIT BREAKER (on CE Control Transformers)	R2, R3, R4	RESISTOR, PRELOAD
CR1–CR6	RECTIFIER, SILICON CONTROL	R5–R10	RESISTOR, SUPPRESSION, 50 OHMS, 5 WATT
CR7	DIODE, FLYBACK	R11	SHUNT, METER
⑧ CR8	DIODE, FLYBACK	R12	SHUNT, FEEDBACK
CR208	DIODE, FLYBACK (WHEN FURNISHED)	R13	POTENTIOMETER, STARTING CURRENT
DS1	PILOT LIGHT, INPUT CONTACTOR, AMBER		
DS2	INDICATOR, LED, OVERLOAD, RED	RV1	SUPPRESSOR, RECEPTACLE
DS3	PILOT LIGHT, OUTPUT CONTACTOR, GREEN		
F1	FUSE, MOTOR, 5 AMP	S1	SWITCH, INPUT CONTACTOR, ON–OFF
F2–F7	FUSE, PC BOARD CONTROL, 1 AMP, 250 VOLTS, AGC, FAST BLOW	S2	SWITCH, OUTPUT CONTACTOR
F8	FUSE, CONTROL TRANSFORMER, 1/2 AMP, 250 V., AGC, FAST BLOW	S4	THERMOSTAT, FAN
F9	FUSE, RECEPTACLE, 10 AMP	S5	THERMOSTAT, OVERLOAD TEMPERATURE
		④ S6	SWITCH, EMERGENCY STOP, 28V. (WHEN FURNISHED)
HS1, HS2	HEAT SINK CONNECTION	S103	SWITCH, OUTPUT VOLTAGE SELECT, 14 OR 28 VOLTS (WHEN FURNISHED)
GND1–GND9	GROUNDING POINTS	SP3, SP4	WIRE SPLICES
J1	RECEPTACLE, PC BOARD, 14 PIN	T1	TRANSFORMER, POWER
J2	RECEPTACLE, PC BOARD, 13 PIN	T2	TRANSFORMER, CONTROL
J3	RECEPTACLE, PC BOARD, 7 PIN	T101	TRANSFORMER, 24 VOLT (BRIDGE INTERLOCK/ REMOTE) (WHEN FURNISHED)
J4	RECEPTACLE, 115 OR 230 VOLT AC		
J5, J6, J7	CONNECTOR, GROUNDING PANELS	TB1	TERMINAL BLOCK, MAIN TRANSFORMER
		TB101	TERMINAL BLOCK, BRIDGE INTERLOCK/ REMOTE (WHEN FURNISHED)
K1	CONTACTOR, INPUT		
K2	CONTACTOR, OUTPUT, 28 VOLTS		
K101, K102	RELAY, 24 VAC, BRIDGE INTERLOCK/ REMOTE (WHEN FURNISHED)		
K201	CONTACTOR, OUTPUT, 14 VOLTS (WHEN FURNISHED)		

04537DCS	9–01
OUTSIDE DISTR.	

DISTRIBUTION TABLE

CHANGE RECORD	
E.C. No.	DATE
2) 2851AA	1/2/02
3) 3002AA	11/26/02
4) 2954AA	1/11/03
5) 3064AA	3/17/03
6) 3160AA	10/9/03
7) 3220AA	3/29/04
8) 3271AA	6/11/04
9) 4146AA	10/15/08
10) 4200AA	11/14/08
11) 4244AA	2/2/09
12) 4865AA	12/6/11

FILE NAME	PLOT DATE
288367S2	2/2/09

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES/MILLIMETERS
TOLERANCES BELOW APPLY EXCEPT FOR VENDOR DESIGNED PARTS AND ITEMS PRODUCED TO RECOGNIZED STANDARDS.
DO NOT SCALE DRAWING.

FRACT. INCH	±	ANGLES	± 3°
DECIMAL–INCH		METRIC	
.00	± .03	0.0	±0.8mm
.000	± .010	0.00	±0.25mm

FINISH CODE PER 910176: NONE

ACTIVITY	REPLACED BY	REPLACES
MATERIAL NO.	QUANTITY–U.M.	COMM. CLS.

MATERIAL SPEC.
–

TITLE
DIAGRAM, SCHEMATIC & CONNECTION

DESCRIPTIVE DATA
LEGEND

DESIGNED	DRAWN	DATE	SCALE
RPH	PRH	8/29/01	FULL
CHECKED	APPROVED	RECORDED	ITEM TYPE
D. Bunyak		9–18–01	

ITW GSE GROUP U.S.A.

SIZE C | DWG. NO. 288367 | SHEET 2 OF 8 ④

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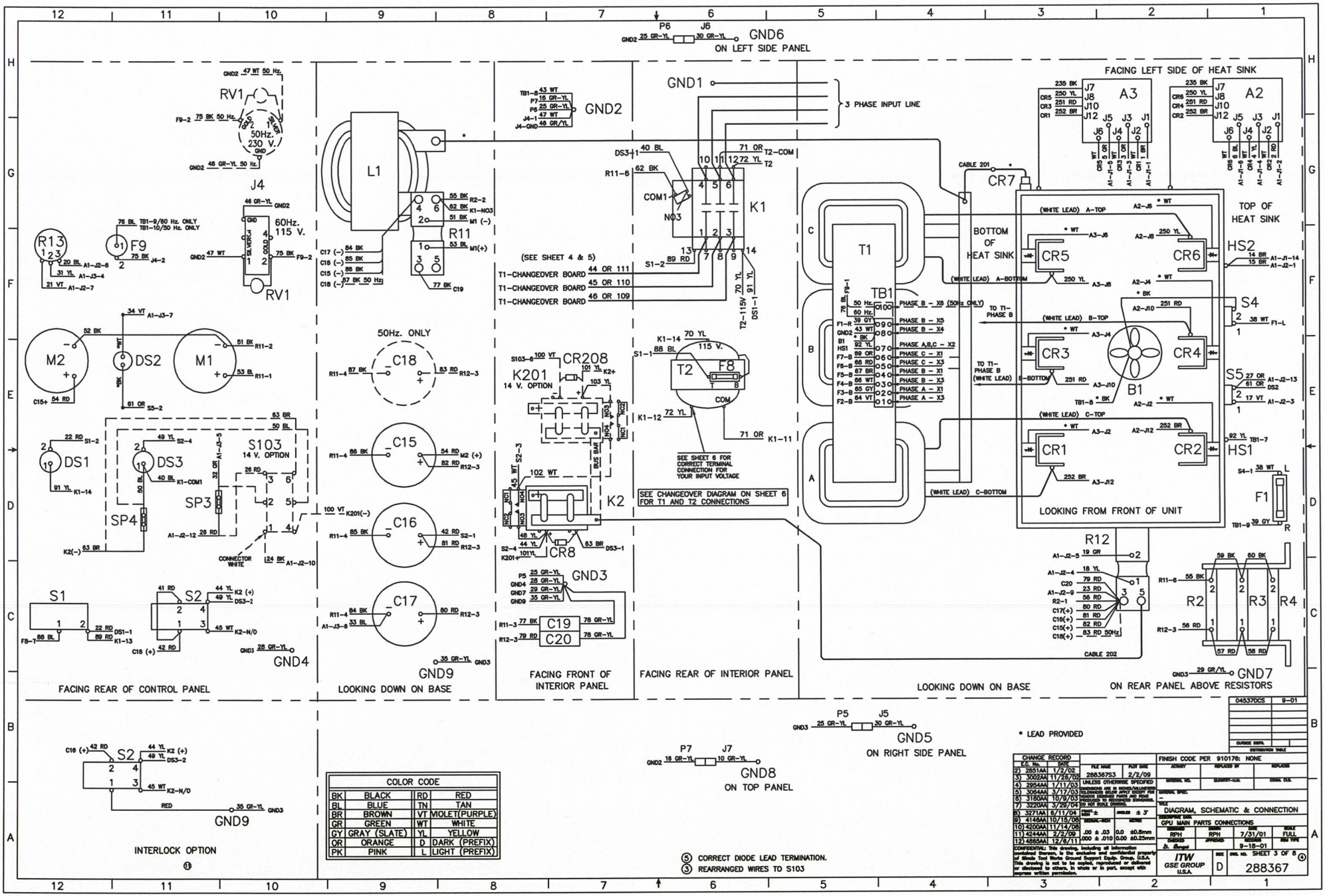

COLOR CODE			
BK	BLACK	RD	RED
BL	BLUE	TN	TAN
BR	BROWN	VT	VIOLET(PURPLE)
GR	GREEN	WT	WHITE
GY	GRAY (SLATE)	YL	YELLOW
OR	ORANGE	D	DARK (PREFIX)
PK	PINK	L	LIGHT (PREFIX)

⑤ CORRECT DIODE LEAD TERMINATION.
③ REARRANGED WIRES TO S103

CHANGE RECORD				
ECO No.	DATE	FILE NAME	PLOT DATE	
2) 2851AA	1/2/02	288367S3	2/2/09	
3) 3002AA	11/28/02	UNLESS OTHERWISE SPECIFIED		
4) 2954AA	1/11/03			
5) 3064AA	3/17/03			
6) 3160AA	10/9/03			
7) 3220AA	3/26/04	DO NOT SCALE DRAWING		
8) 3271AA	8/11/04	DECIMAL ±	ANGLES ± 3°	
9) 4146AA	10/15/06	DECIMAL-INCH	METRIC	
10) 4200AA	11/14/08	.00 ± .03	0.0 ±0.8mm	
11) 4244AA	2/2/09	.000 ± .010	0.00 ±0.25mm	
12) 4885AA	12/6/11			

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04537DCS	9-01		
SURFACE FINISH	DISTRIBUTION TABLE		

FINISH CODE PER 910176: NONE

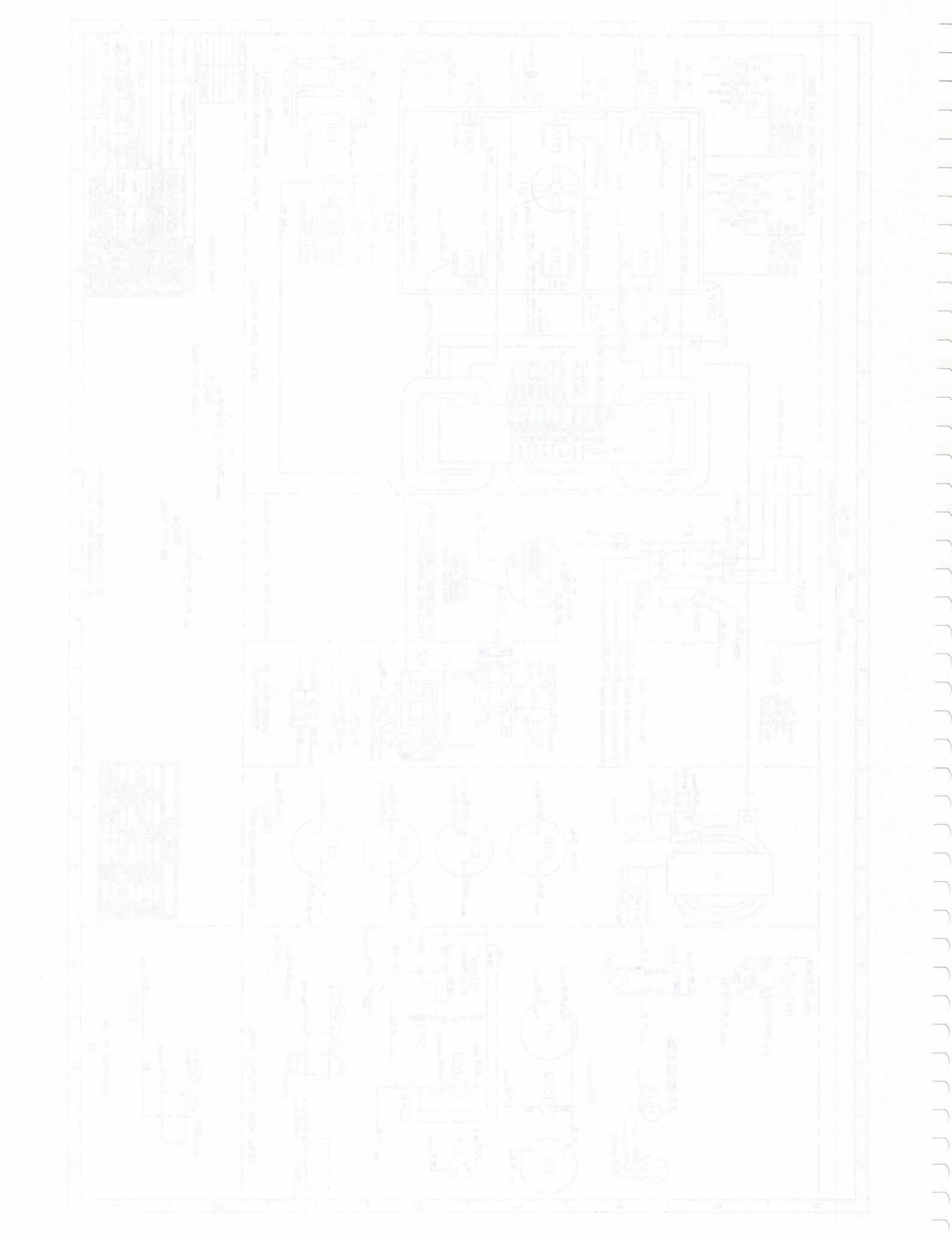
ACTIVITY	REPLACED BY	REPLACES
MATERIAL NO.	QUANTITY-U.S.A.	COMM. U.S.A.

MATERIAL SPEC.
-
TITLE
DIAGRAM, SCHEMATIC & CONNECTION
CONTRACTOR ITEM
GPU MAIN PARTS CONNECTIONS

DESIGNED	DATE	SCALE
RPH	7/31/01	FULL
DRAWN	APPROVED	DATE
RPH		9-18-01
CHECKED	ENGINEER	MFG TYPE
A. Bengal		

ITW GSE GROUP U.S.A.

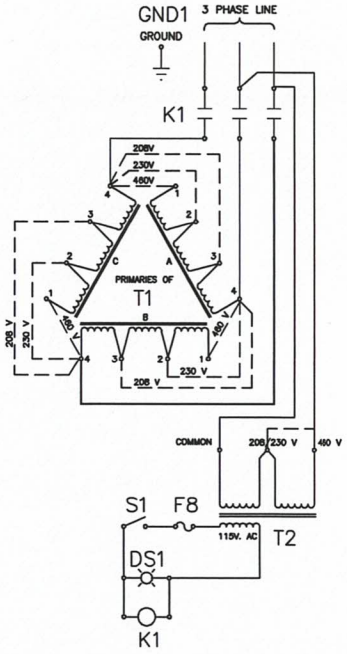
SIZE D | DWG. NO. 288367 | SHEET 3 OF 8 ④

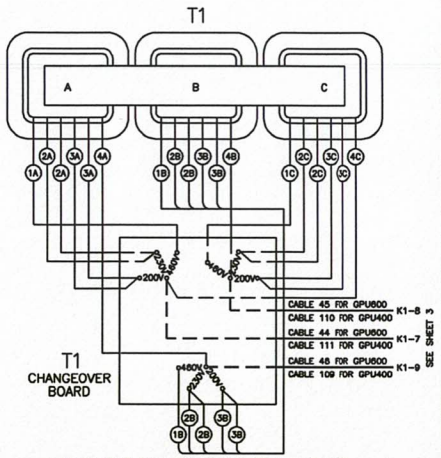


Applies only to units:

500160 -401, -421, -451, -601, -621, -641

208/220/230/460 VAC, 60 Hz



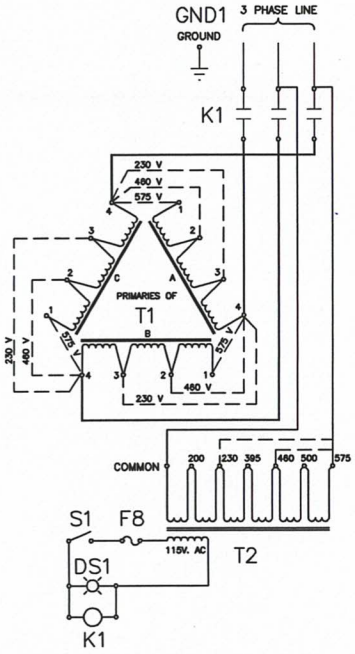


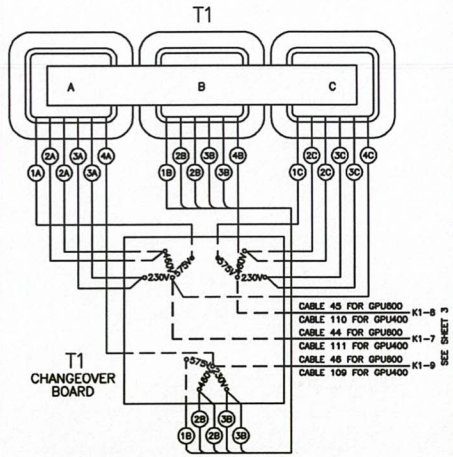
FACING VOLTAGE CHANGEOVER PANEL FROM TOP FRONT

Applies only to units:

500160 -403, -603, -653

230/460/575 VAC, 60 Hz



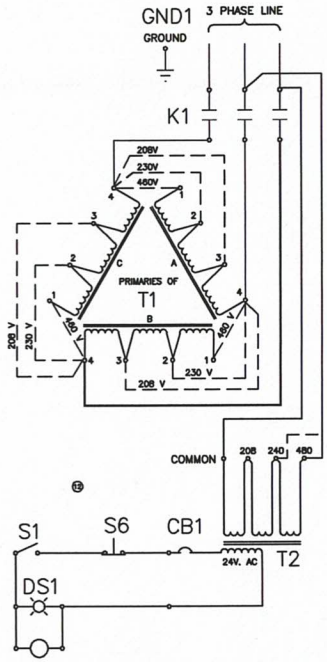


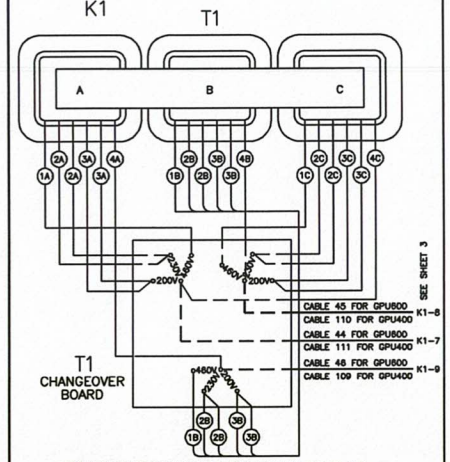
FACING VOLTAGE CHANGEOVER PANEL FROM TOP FRONT

Applies only to units:

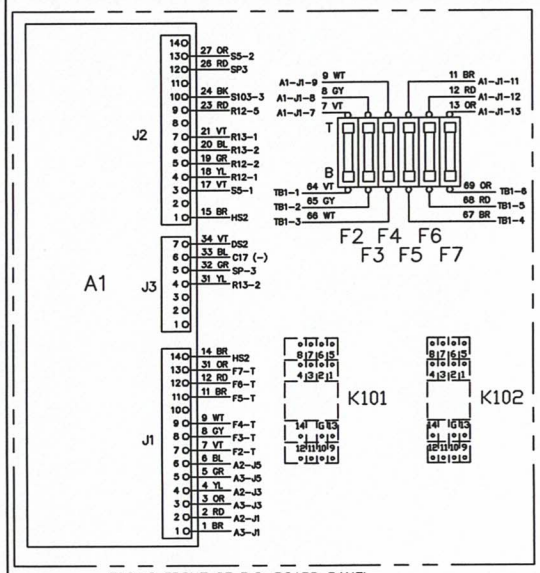
500160-611

208/230/460 VAC, 60 Hz, CE





FACING VOLTAGE CHANGEOVER PANEL FROM TOP FRONT



FACING FRONT OF P.C. BOARD PANEL

COLOR CODE			
BK	BLACK	RD	RED
BL	BLUE	TN	TAN
BR	BROWN	VT	VIOLET(PURPLE)
GR	GREEN	WT	WHITE
GY	GRAY (SLATE)	YL	YELLOW
OR	ORANGE	D	DARK (PREFIX)
PK	PINK	L	LIGHT (PREFIX)

CHANGE RECORD				
E.C. No.	DATE		FILE BASE	PLOT DATE
2) 2851AA	1/2/02		288367S4	2/2/09
3) 3002AA	11/28/02		UNLESS OTHERWISE SPECIFIED	
4) 2954AA	1/11/03		DIMENSIONS ARE IN INCHES/MILLIMETERS	
5) 3064AA	3/17/03		TOLERANCES: FRACTIONS ± 1/64" DECIMALS ± .005"	
6) 3180AA	10/9/03		PRODUCED TO RECOGNIZED STANDARDS.	
7) 3220AA	3/29/04		DO NOT SCALE DRAWING.	
8) 3271AA	6/11/04		ANGLES ± 1°	
9) 4148AA	10/15/08		DECIMAL=INCH	METRIC
10) 4200AA	11/14/08		.00 ± .03	0.0 ±0.8mm
11) 4244AA	2/2/09		.000 ± .010	0.00 ±0.25mm

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045370CS	9-01
OUTSIDE SHEET	DISTRIBUTION TABLE

FINISH CODE PER 910176: NONE

DESIGNED	DRAWN	DATE	SCALE
RPH	RPH	7/31/01	FULL
CHECKED	APPROVED	RELEASED 9-18-01	FILM TYPE

ITW GSE GROUP U.S.A.	SIZE D	DWG. NO. 288367	SHEET 4 OF 8

ADMIN	REPLACED BY	REPLACES
MATERIAL NO.	ELEVATION-CLASS.	CONST. CLASS.
GENERAL SPEC.		

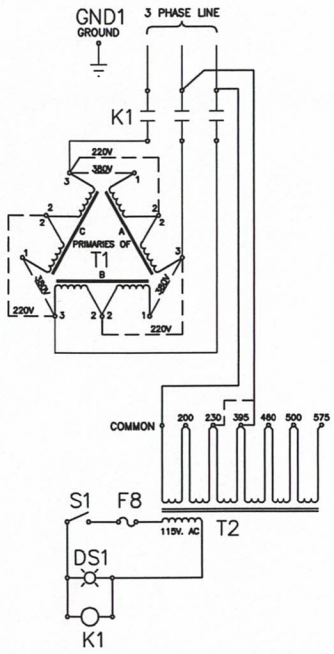
TITLE: DIAGRAM, SCHEMATIC & CONNECTION

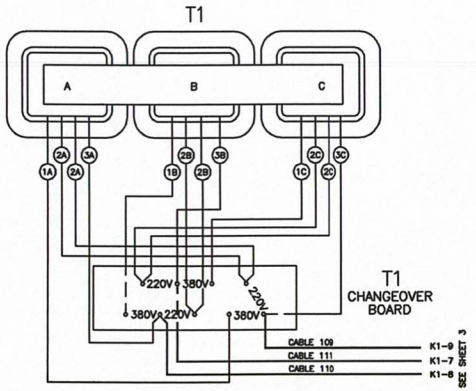
DESCRIPTION: GPU 60 Hz. TRANSFORMER AND PC BOARD

Applies only to units:

500160 -402, -422, -452

220/380 VAC, 50 Hz



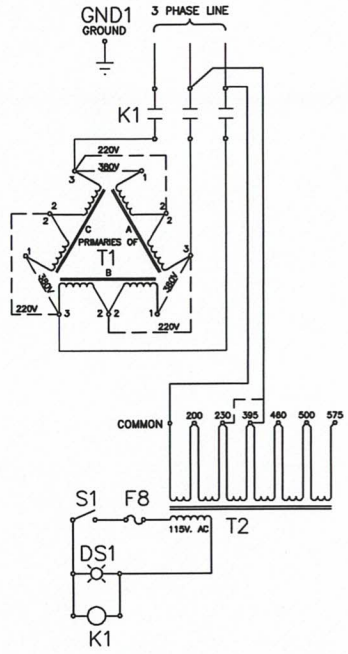


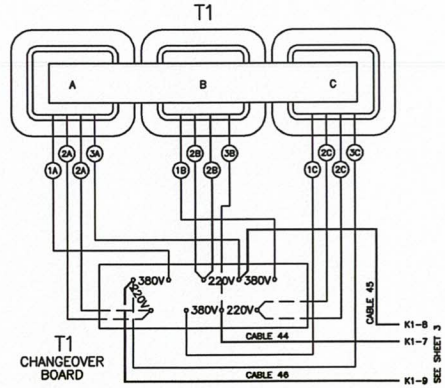
FACING VOLTAGE CHANGEOVER PANEL FROM TOP FRONT

Applies only to units:

500160 -602, -622, -652

220/380 VAC, 50 Hz





FACING VOLTAGE CHANGEOVER PANEL FROM TOP FRONT

CHANGE RECORD					
E.C. No.	DATE		FILE BASE	PLOT DATE	
2) 2851AA	1/2/02		288367S5	2/2/09	
3) 3002AA	11/28/02		UNLESS OTHERWISE SPECIFIED		
4) 2954AA	1/17/03		DIMENSIONS ARE IN INCHES/MILLIMETERS		
5) 3064AA	3/17/03		TOLERANCES ARE:		
6) 3180AA	10/9/03		PROHIBITED TO REPRODUCE DRAWING.		
7) 3220AA	3/29/04		DO NOT SCALE DRAWING.		
8) 3271AA	6/11/04		ANGLES ± 3°		
9) 4148AA	10/15/08		DECIMAL-INCH	METRIC	
10) 4200AA	11/14/08		.00 ± .03	0.0 ±0.8mm	
11) 4244AA	2/2/09		.000 ± .010	0.00 ±0.25mm	
12) 4865AA	12/6/11				

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04537DCS	9-01		

FINISH CODE PER 910176: NONE

ACTIVITY	REPLACED BY	REPLACES	
MATERIAL NO.	QUANTITY-U.S.A.	COMP. QUA.	
MATERIAL SPEC.			
TITLE	DIAGRAM, SCHEMATIC & CONNECTION		
DESCRIPTIVE TEXT	GPU 50Hz. TRANSFORMER		
DESIGNED RPH	DRAWN RPH	DATE 7/31/01	SCALE FULL
CHECKED	APPROVED	RELEASED 9-18-01	WAS TYPE

ITW GSE GROUP U.S.A.

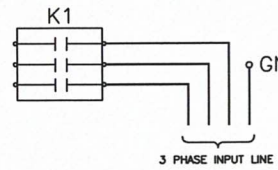
SIZE D | DWG. NO. 288367 | SHEET 5 OF 8

COLOR CODE			
BK	BLACK	RD	RED
BL	BLUE	TN	TAN
BR	BROWN	VT	VIOLET(PURPLE)
GR	GREEN	WT	WHITE
GY	GRAY (SLATE)	YL	YELLOW
OR	ORANGE	D	DARK (PREFIX)
PK	PINK	L	LIGHT (PREFIX)

INSTRUCTIONS FOR SETTING VOLTAGE CHANGEOVER PANEL AND CONNECTING POWER LINE

(ALSO SEE INFORMATION IN INSTRUCTION MANUAL)

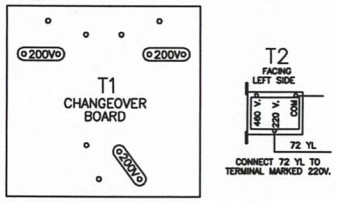
1. CHECK NAMEPLATE OF THE UNIT TO BE CERTAIN IT IS DESIGNED FOR THE LINE VOLTAGE TO WHICH YOU WISH TO CONNECT IT.
2. CONNECT THE LINKS AS SHOWN IN THE FIGURES BELOW, AS APPLICABLE, FOR THE UNIT SPECIFICATION NUMBER AND PROPER LINE VOLTAGE.
3. CHECK YOUR LOCAL CODES FOR THE PROPER LINE WIRE SIZE FOR THE LINE CURRENT SHOWN ON THE NAMEPLATE OF THE UNIT. IF NO CODES EXISTS, USE THE CHART IN THE "INSTALLATION" SECTION OF THE MANUAL.
4. CONNECT THE 3 PHASE POWER LINE TO THE INPUT CONTACTOR (K1), AS SHOWN IN THE DIAGRAM ON THE RIGHT. (CAUTION – BE CERTAIN INPUT CIRCUIT IS OPEN BEFORE HANDLING LINE.)
5. CONNECT THE POWER SYSTEM GROUND TO THE SCREW ON THE INTERIOR PANEL MARKED "GROUND".



VIEWING REAR OF INTERIOR PANEL

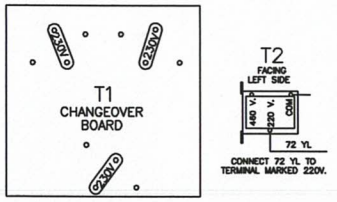
VOLTAGE CHANGEOVER DIAGRAMS

(13) Applies only to units:
500160 -401, -421, -451
500160 -601, -621, -651



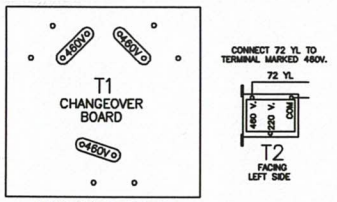
LINK CONFIGURATION

FIGURE 1
208 VOLT, 60 Hz. LINE



LINK CONFIGURATION

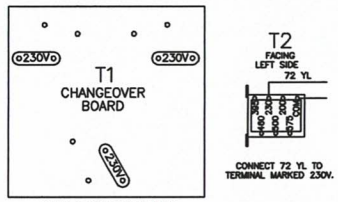
FIGURE 2
230 VOLT, 60 Hz. LINE



LINK CONFIGURATION

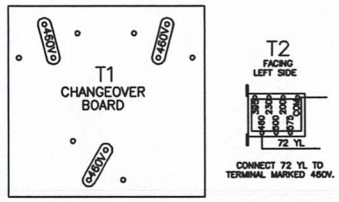
FIGURE 3
460 VOLT, 60 Hz. LINE

(12) Applies only to units:
500160 -403
500160 -603, -653



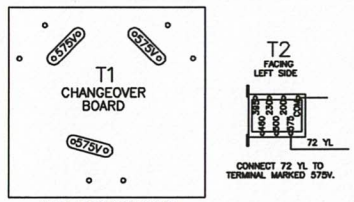
LINK CONFIGURATION

FIGURE 1
230 VOLT, 60 Hz. LINE



LINK CONFIGURATION

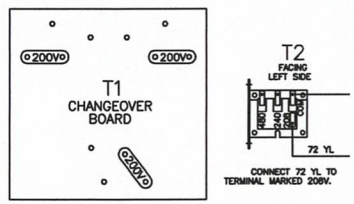
FIGURE 2
460 VOLT, 60 Hz. LINE



LINK CONFIGURATION

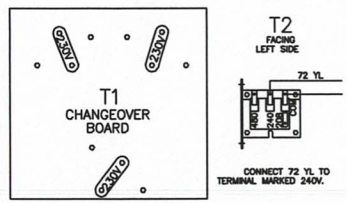
FIGURE 3
575 VOLT, 60 Hz. LINE

(12) Applies only to units:
500160 -411 (CE)
500160 -611 (CE)



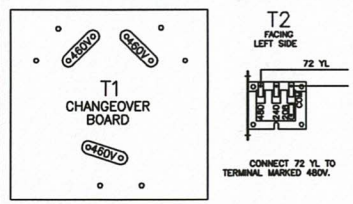
LINK CONFIGURATION

FIGURE 1
208 VOLT, 60 Hz. LINE



LINK CONFIGURATION

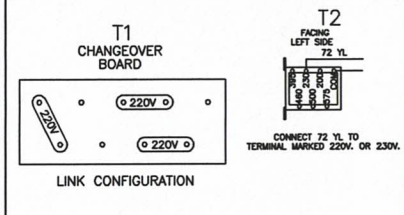
FIGURE 2
230 VOLT, 60 Hz. LINE



LINK CONFIGURATION

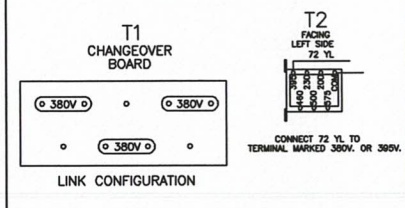
FIGURE 3
460 VOLT, 60 Hz. LINE

(15)(16) Applies only to units:
500160 -402, -422, -452
500160 -602, -622, -652



LINK CONFIGURATION

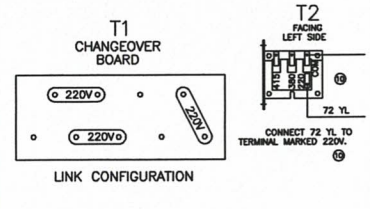
FIGURE 2
220 VOLT, 50 Hz. LINE



LINK CONFIGURATION

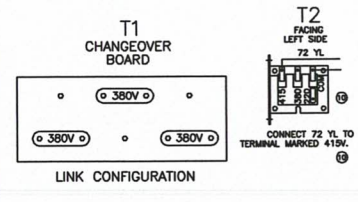
FIGURE 1
380 VOLT, 50 Hz. LINE

(15)(16) Applies only to units:
500160 -412 (CE)
500160 -612 (CE)



LINK CONFIGURATION

FIGURE 2
220 VOLT, 50 Hz. LINE



LINK CONFIGURATION

FIGURE 1
380 VOLT, 50 Hz. LINE

④ ADDED 500160-412 & 500160-612

CHANGE RECORD				
E.C. No.	DATE		FILE NAME	PLOT DATE
2) 2851AA	1/2/02		28836756	2/2/09
3) 3020AA	11/25/02		UNLESS OTHERWISE SPECIFIED	
4) 2954AA	1/11/03		DIMENSIONS ARE IN INCHES/TOLERANCES	
5) 3064AA	3/17/03		TOLERANCES BELOW APPLY EXCEPT FOR	
6) 3180AA	10/9/03		PURCHASED PARTS WHICH HAVE	
7) 3220AA	3/29/04		PRINTED TO RECOGNIZED STANDARDS.	
8) 3271AA	6/11/04		DO NOT SCALE DRAWING.	
9) 4148AA	10/15/08		FRACT.±	ANGLES ± 3°
10) 4200AA	11/14/08		DECIMAL±.XXX	METRIC
11) 4244AA	12/2/08		.00 ± .03	.0 ±0.8mm
12) 4865AA	12/6/11		.000 ± .010	.00 ±0.25mm

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045370CS	9-01	
OUTSIDE CONTR.		
DISTRIBUTION TABLE		

FINISH CODE PER 910178: NONE

ACTIVITY	REPLACED BY	REPLACES
MATERIAL NO.	ELEVATION	COMM. CUS.
MATERIAL SPEC.		

TITLE
DIAGRAM, SCHEMATIC & CONNECTION

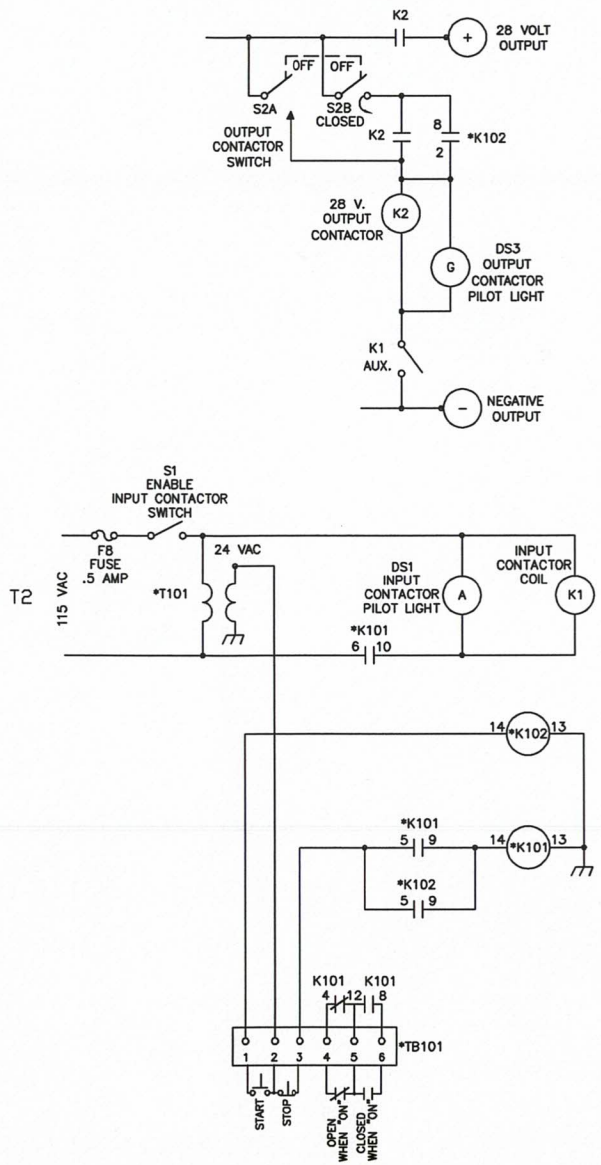
DRAWING SIZE
GPU CHANGEOVER PANEL AND INPUT CONNECTION

DESIGNED	DRAWN	DATE	SCALE
RPH	RPH	7/31/01	FULL
CHECKED	APPROVED	RELEASED	SIZE TYPE
		9-18-01	

ITW GSE GROUP U.S.A.

SIZE D | DWG. NO. 288367 | SHEET 6 OF 8 ④

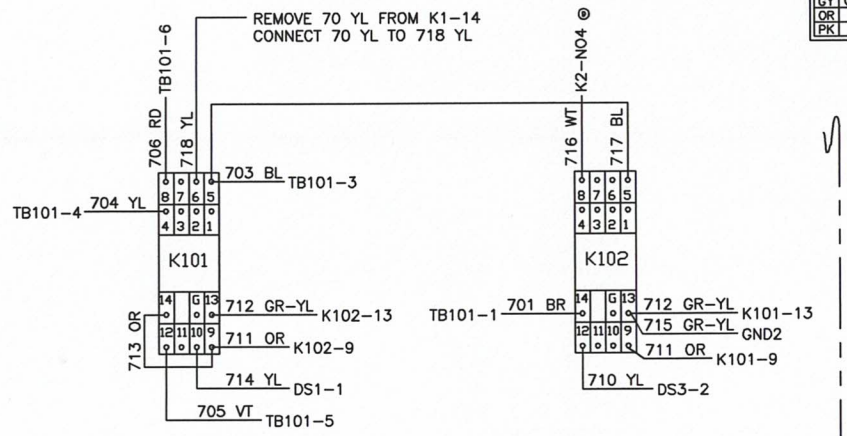
SCHEMATIC DIAGRAM



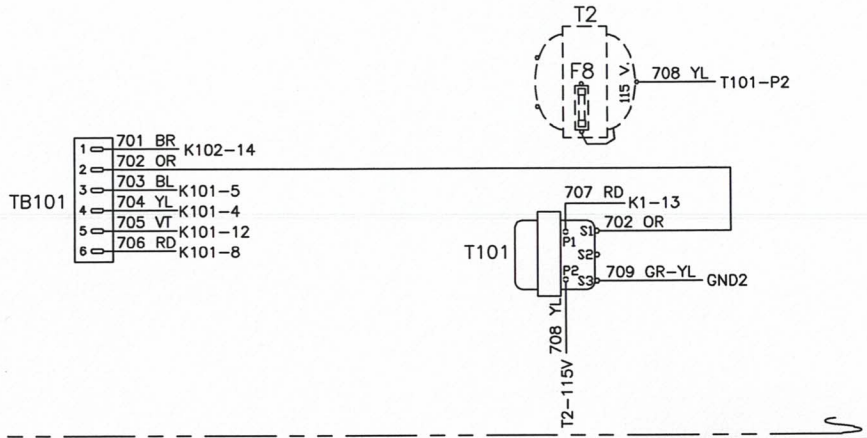
* BRIDGE INTERLOCK PART

CONNECTION DIAGRAM

COLOR CODE			
BK	BLACK	RD	RED
BL	BLUE	TN	TAN
BR	BROWN	VT	VIOLET(PURPLE)
GR	GREEN	WT	WHITE
GY	GRAY (SLATE)	YL	YELLOW
OR	ORANGE	D	DARK (PREFIX)
PK	PINK	L	LIGHT (PREFIX)



FACING P.C. BOARD PANEL



FACING FAN SIDE OF LIFTING YOKE

⊛ BRIDGE INTERLOCK & REMOTE (NON CE UNITS)

① ADDED TERM. DESIGNATIONS TO T101, 704YL TO K101, & 708 YL TO T2

CHANGE RECORD		
E.C. No.	DATE	
2) 2851AA	1/2/02	
3) 2933AA	11/26/02	
4) 2954AA	1/17/03	
5) 3044AA	3/17/03	
6) 3180AA	10/9/03	
7) 3220AA	3/29/04	
8) 3271AA	8/11/04	
9) 4146AA	10/15/08	
10) 4200AA	11/14/08	
11) 4244AA	2/2/09	
12) 4985AA	12/8/11	

FILE NAME	28836757
PLOT DATE	2/2/09
UNLESS OTHERWISE SPECIFIED	
DIMENSIONS ARE IN INCHES/MILLIMETERS	
TOLERANCES ARE:	
FRACT ±	ANGLES ± 3°
DECIMAL-INCH	METRIC
.00 ± .03	0.0 ±0.8mm
.000 ± .010	0.00 ±0.25mm

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045370CS	9-01	
DRAWING SHEET	DISTRIBUTION TABLE	

FINISH CODE PER 910176: NONE

DRAWN	REVISED BY	RELEASED
MATERIAL NO.	ELIGIBILITY LIST	CODE, U.S.

MATERIAL SPEC.
-

TITLE
DIAGRAM, SCHEMATIC & CONNECTION

DRAWING NO.
GPU-600 W/BRIDGE INTERLOCK & REMOTE CON.

DESIGNED	DRAWN	DATE	SCALE
RPH	RPH	8/29/01	FULL
CHECKED	APPROVED	REVISED	SHEET TYPE
A. Bengel		9-18-01	

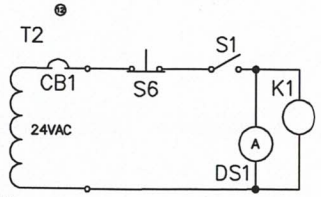
ITW GSE GROUP U.S.A.

SIZE D

DWG. NO. 288367

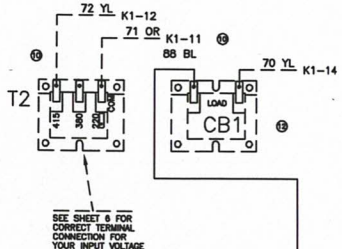
SHEET 7 OF 9 ④

CE SCHEMATIC DIAGRAM

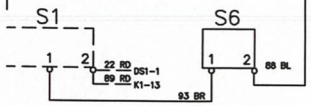


SEE VOLTAGE CHANGEOVER DIAGRAM

CE CONNECTION DIAGRAM



FACING REAR OF INTERIOR PANEL



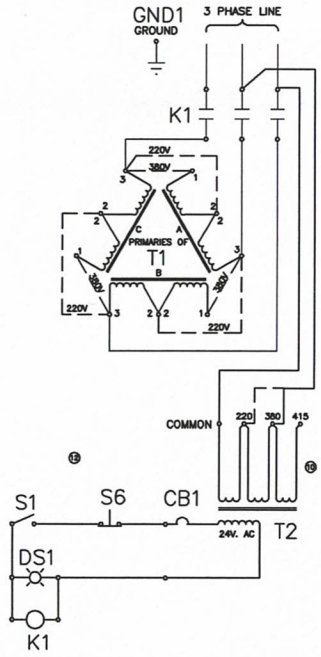
FACING REAR OF CONTROL PANEL

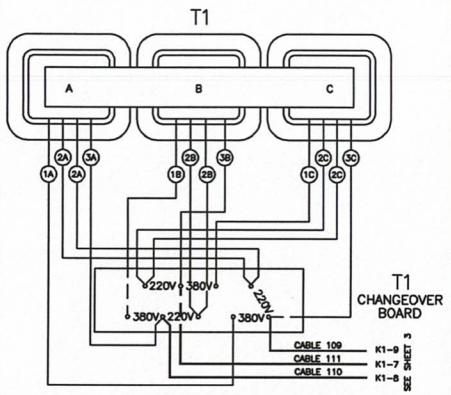
COLOR CODE			
BK	BLACK	RD	RED
BL	BLUE	TN	TAN
BR	BROWN	VT	VIOLET(PURPLE)
GR	GREEN	WT	WHITE
GY	GRAY (SLATE)	YL	YELLOW
OR	ORANGE	D	DARK (PREFIX)
PK	PINK	L	LIGHT (PREFIX)

Applies only to:

500160-412

220/380 VAC, 50 Hz, CE



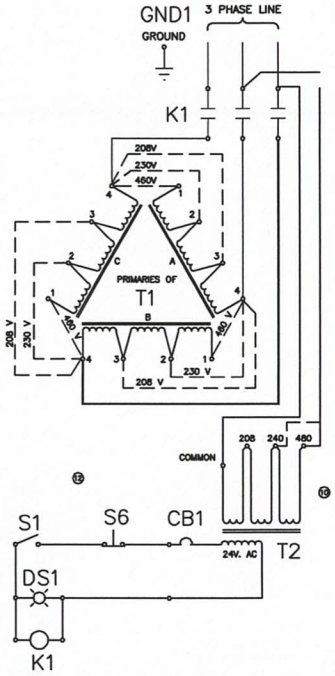


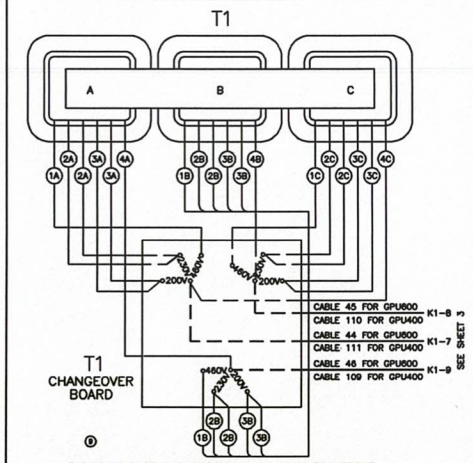
FACING VOLTAGE CHANGEOVER PANEL FROM TOP FRONT

Applies only to:

500160-411

208/230/460 VAC, 60 Hz, CE



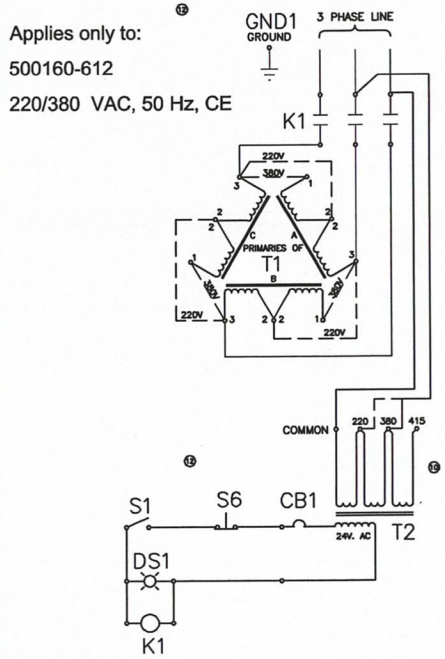


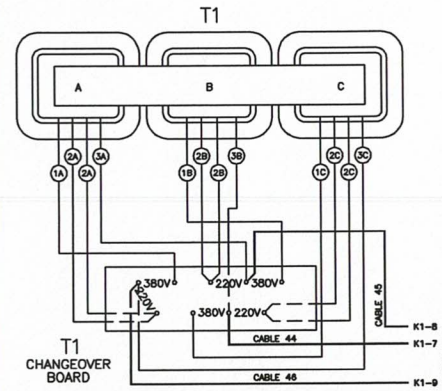
FACING VOLTAGE CHANGEOVER PANEL FROM TOP FRONT

Applies only to:

500160-612

220/380 VAC, 50 Hz, CE





FACING VOLTAGE CHANGEOVER PANEL FROM TOP FRONT

| CHANGE RECORD | | |

Appendix A Options / Features

The following is a list of options/features available for the 500160, GPU-400 Solid State Transformer-Rectifier. This chart contains the description, part number, and document number of the option/feature. There is also a column to identify which option/feature is contained in this Appendix.

Option/Features Available			
Description	**Part Number**	**Document Number**	**In This Section**
Kit, 14 Volt Output	288386	TO-285	
Kit, Cable Tray	288360	TO-274	
Kit, Bridge Mount	288387	TO-287	
Plug, Locking (Fits 50 Hz. Aux.)	288582-001		
Kit, Cable Interlock, GPU 400/600	290698		
Kit, Cover, Dust	291594-001	TO-338	

Unusual Service Conditions

This information is a general guideline and cannot cover all possible conditions of equipment use. The specific local environments may be dependent upon conditions beyond the manufacturer's control. The manufacturer should be consulted if any unusual conditions of use exist which may affect the physical condition or operation of the equipment.

Among such conditions are:

1) Exposure to:

a) Combustible, explosive, abrasive or conducting dusts

b) Environments where the accumulation of lint or excessive dirt will interfere with normal ventilation

c) Chemical fumes, flammable, or explosive gases

d) Nuclear radiation

e) Steam, salt-laden air, or oil vapor

f) Damp or very dry locations, radiant heat, vermin infestation, or atmospheres conducive to fungus growth

g) Abnormal shock, vibration or mechanical loading from external sources during equipment operation

h) Abnormal axial or side thrust imposed on rotating equipment shafts

i) Low and/or high ambient temperatures

j) High electromagnetic fields

2) Operation at:

a) Voltages above or below rated voltage

b) Speeds other than rated speed

c) Frequency other than rated frequency

d) Standstill with rotating equipment windings energized

e) Unbalanced voltages

f) Operation at loads greater than rated

3) Operation where low acoustical noise levels are required

4) Operation with:

a) Improper fuel, lubricants or coolant

b) Parts or elements unauthorized by the manufacturer

c) Unauthorized modifications

5) Operation in poorly ventilated areas

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